LAKE OKEECHOBEE WATER SUPPLY MANAGEMENT PLAN

July 1985

Prepared By:
South Florida Water Management District

Lake Okeechobee Water Supply Management Plan

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500 790 Produced on recycled paper.

Introduction

Lake Okeechobee has often been referred to as the liquid heart of south Florida. It is the most efficient water storage facility within the South Florida Water Management District boundaries. It is truly an integral part of the regional system, and has a water supply storage capacity of 3,221,000 acre-feet, more than one trillion gallons!

Unfortunately, by mid-July 1985 the lake had dropped to 70% below its maximum. It was becoming evident there would not be enough available water in storage to meet south Florida's ever growing demands through the next dry season into 1986.

In south Florida we have the capability of drawing from a regional surface water storage system rather than relying on local rainfall recharge alone. Although we use the regional nature of the system infrequently, when the need arises we have to be ready. This is why the supply of available water in Lake Okeechobee is so important to the operation of the total water management system.

In recognition of the problems associated with ever increasing growth and its inevitable impact on our finite water supply, the South Florida Water Management District has built flexibility into its management practices.

This flexibility is reflected in our Core Mission Statement which states that it is the District's responsibility to manage water and related resources for the benefit of the public and in keeping with the needs of the region for the purposes of providing: environmental protection and enhancement; water suppy; flood protection; and water quality protection.

Most of the time we are able to operate the system for the maximum benefit of environmental protection and enhancement along with water quality protection. However, the subtropical climate of south Florida dictates that we must periodically operate in a flood control or water supply mode which may override environmental considerations.

Needed releases from the lake to meet heavy water demands, combined with high natural losses from evapotranspiration and continued lack of rainfall, led to the critically low Lake Okeechobee level of 11.85 feet NGVD on July 11, 1985. In anticipation of the computer predicted possibility of a serious water shortage next year, the District found it necessary to suspend the DER approved Interim Action Plan in order to bolster reserves in the lake.

The South Florida Water Management District does not support backpumping from the nutrient enriched Everglades Agricultural Area (EAA) into Lake Okeechobee as a long range strategy for increasing water supplies. This operational procedure is employed only under strict emergency conditions. Technical data support this particular water management option as the most appropriate short term tool available to help increase lake storage at this time.

The District has undertaken numerous studies to determine the state of Lake Okeechobee's health. Long term protection of this valuable resource is paramount to the District. We have a stringent monitoring program in place during backpumping: samples are taken daily during backpumping events and field measurements are reported to District headquarters immediately. The data collected is used to strictly enforce operating criteria. Our analyses to date indicate that no use impairment has occurred as a direct result of backpumping.

Our goal is for a long range strategy incorporating both protection of the lake as well as insuring an adequate water supply for south Florida's growing population. The District's primary water management objective in the EAA is to improve the quality of the water so that it will be available for all beneficial uses. To accomplish this objective, the agricultural community, in conjunction with the Water Management District, is expected to immediately initiate engineering, economic, and feasibility studies of all water management alternatives for improving water quality in the EAA.

The only currently available operational option that can increase lake storage is backpumping; however, other water management techniques have been successfully employed to help conserve a dwindling water supply during a drought period.

The District's Water Shortage Plan, developed to protect the water resources and to assure equitable distribution of available water supplies among all water users during times of shortage, was put into action this spring to help reduce the heavy demand. The District received excellent cooperation from local governments and landowners in implementing the Plan. Water conservation material was printed and distributed by the District. A long range public education program is currently under development. The District encourages water conservation as a year-round way of life, not just to be emphasized during times of shortage.

Another way to stretch a limited supply is to recognize the benefits of water reclamation. At least half of the 200 gallons of water used per person per day in south Florida is allocated to landscape irrigation. Many golf courses in our District are already using treated wastewater for irrigation purposes and several more are in the process of converting to this highly efficient reuse of the resource. In recognition of the importance of this water conservation practice, the District's Water Shortage Plan exempts golf courses that exclusively use wastewater effluent for irrigation from any water use restrictions.

Wise water management requires constant readjustment, fine tuning, and revision to deal adequately with a system which is always in a state of flux. The South Florida Water Management District is charged with attempting to balance an unpredictable natural resource against a variety of unlimited and constant demands. The flexible approach which we use to operate this system should allow us to successfully meet the challenge of water management in the future.

I. SUMMARY

The purpose of this report is to provide relevant background information on the Lake Okechobee water supply situation as of the July 11-12, 1985 Governing Board meeting, and the rationale for decisions regarding suspension of the Interim Action Plan and other lake storage conservation measures.

Lake Okeechobee plays a vital role in the regional water supply for south Florida. It serves as the primary water supply for the Everglades Agricultural Area (EAA) and several urban communities located near the lake (Okeechobee, Moore Haven, Clewiston, South Bay, Belle Glade, and Pahokee), and as a backup, secondary source of supply for the Lower East Coast (LEC) urban areas (Palm Beach, Broward, Dade, and Monroe Counties), Everglades National Park, and the Ft. Myers urban area. This secondary role is critical during water shortage periods, particularly near the end of the dry season. For example, during years when rainfall is 85% of normal (1 in 5 year drought), the lake supplies the LEC with supplemental water during March, April, and May. When rainfall drops to about 65% of normal (1984-85 dry season was 67% of normal), supplemental water deliveries from the lake to the LEC could begin as early as December. Water deliveries this past dry season began in January.

For the month of June, the District received 77% of normal rainfall, ranging from 62% for St. Lucie County to 92% for the upper Kissimmee basin. More variability occurred during the first week of July, with rainfall varying from 7% of normal for the lower Kissimmee basin to 132% of normal for the Water Conservation Areas, and the overall District average was 71% of normal. The lower than normal rainfall resulted in a Lake Okeechobee stage of 11.85 ft NGVD on July 11, 1985. For the month of June, only 26,000 AF of storage was added to the total system storage.

Thus, with one month into the traditional rainy season no significant gains in total system water storage had occurred, particulary for Lake Okeechobee.

Based on water conditions as of July 1, modeling runs were made assuming various percentages of normal rainfall for the period July 1985 - May 1986. Results of the modeling indicated that even with normal rainfall the lake stage on October 1, 1985 would be 14.04 ft NGVD, approximately 3.5 ft below the regulation schedule. Further, with normal rainfall for the 1985-86 dry season and the remainder of the wet season, the lake stage on May 31, 1986 would be approximately 11.0 ft NGVD which is considered as minimally acceptable for the beginning of the wet season. If below normal rainfall occurs during the period, south Florida will probably experience water shortage conditions during the Spring of 1986. Since the probability of increasing lake storage occurs during the traditional rainy season, it is critical that decisions for increasing and/or conserving lake storage be made as early as feasible during the rainy season. The three major options considered were (1) suspension of the IAP (Interim Action Plan) to allow increased backpumping to the lake using S-2 and S-3, (2) implementing the District's Water Shortage Rule, and (3) implementing Supply-Side Management for the Lake Okeechobee service area. Since the largest water supply demands occur during the period November through May each year (dry season), Options 2 and 3 would have the greatest positive effect on conserving storage since they control demands on the Lake during that period. Option 1 (backpumping) is the only short term option available which can take advantage of wet season conditions to increase lake storage. However, there are water quality risks involved with backpumping since total nitrogen and total phosphorus loads to the lake would increase dramatically compared to the IAP. Balancing the water supply and water quality risks for Lake Okeechobee resulted in the development of a "Lake Okeechobee Water Supply Operational Limits" decision graph (Figure 36, page 79), which defines two decision lines. The lower or BP (backpumping) line indicates that, with a starting stage of 11.0 ft NGVD on June 1 and assuming normal rainfall, there is a 50% chance of having a water shortage during the following Spring. When the actual lake stage drops below this line, as it did on July 11, the IAP would be suspended and S-2 and S-3 water supply backpumping would be initiated. Backpumping would continue (whenever runoff is generated in the drainage basins) until the actual lake stage exceeds the upper or IAP line; or the end of the rainy season; or recommended water quality or operational criteria which are designed to reduce water quality impacts on the lake during backpumping. The upper line on the decision graph represents the lake stages that would occur if the District received 85% of normal rainfall through May 1986, or, expressed another way, there would be a 20% chance of water shortage conditions during the following Spring. Not only will the graph be used in making backpumping decisions, but also at the beginning of the dry season as a guide in implementing water supply demand reduction measures (Options 2 and 3).

II. WATER CONDITIONS

WEATHER/RAINFALL SUMMARY

June Summary

The month of June started out on a very dry note, but the "rainy season" finally made its debut toward the end of the second week. Rainfall during the remainder of the month of June was normal to above normal, but was not sufficient to compensate for the very dry conditions that occurred at the beginning of the month. The highest total amounts of rainfall occurred at S-7 (13.35 inches) and at Clermont (11.36 inches). The least amount of rainfall (2.13 inches) occurred at Flamingo. The distribution of rainfall for various parts of the District during the month of June was as follows:

Area	Weighted Average Rainfall (Inches)	Percent of Normal
Upper Kissimmee	6.96	92
Lower Kissimmee	6.44	78
Conservation Areas	7.73	81
Agricultural areas	6.55	74
Lake Okeechobee	6.64	82
St. Lucie	4.27	62
Lower East Coast	6.26	69
Caloosahatchee	4.88	63
Collier County	6.69	82
District Overall	6.33	77

The distribution of total rainfall throughout the District for the month of June, 1985 is shown in Figure 1. Figure 2 shows the normal rainfall distribution for the month of June.

July Outlook

Rainfall for the first week of July is summarized in the following table:

Area	Weighted Average Rainfall (Inches)	Percent of Normal
Upper Kissimmee	0.97	57
Lower Kissimmee	0.52	7
Conservation Areas	2.09	132
Agricultural areas	1.25	70
Lake Okeechobee	0.87	52
St. Lucie	1.78	121
Lower East Coast	0.86	59
Caloosahatchee	0.54	31
Collier County	1.70	94
District Overall	1.18	71

Most of this rainfall occurred in the first four days of the week and conditions have been quite dry since. The wettest spot so far has been S-7 with 4.98 inches. The driest area is the mid- to lower-Kissimmee Basin. No rain has been reported this month at S-65C and S-65D.

From a weather standpoint, July begins what could be considered "deep" summer, with mid-latitude influences at their annual minimum. This, combined with a climatological lack of significant tropical disturbances affecting the area during this month, causes July to show a slight overall decrease in average rainfall.

The Bermuda High, with its attendant basic easterly flow both at the surface and aloft, usually becomes very well established during July, and rainfall distributions demonstrate this. Normal rainfall on the east coast is around 6.5 inches, increasing to 8.0 inches along the southwest coast, as the easterly flow develops thunderstorms in the inland areas and moves them to the west coast in the late afternoon. In the rainy season it is normal to have alternating periods of wet and dry weather, such as the changes that we have seen during the last few days.

Tropically, July is a quiet month with a tropical storm forming on the average of once every other year. In the last 100 years, only one fully developed hurricane struck South Florida during the month of July, and it was a relatively weak storm.

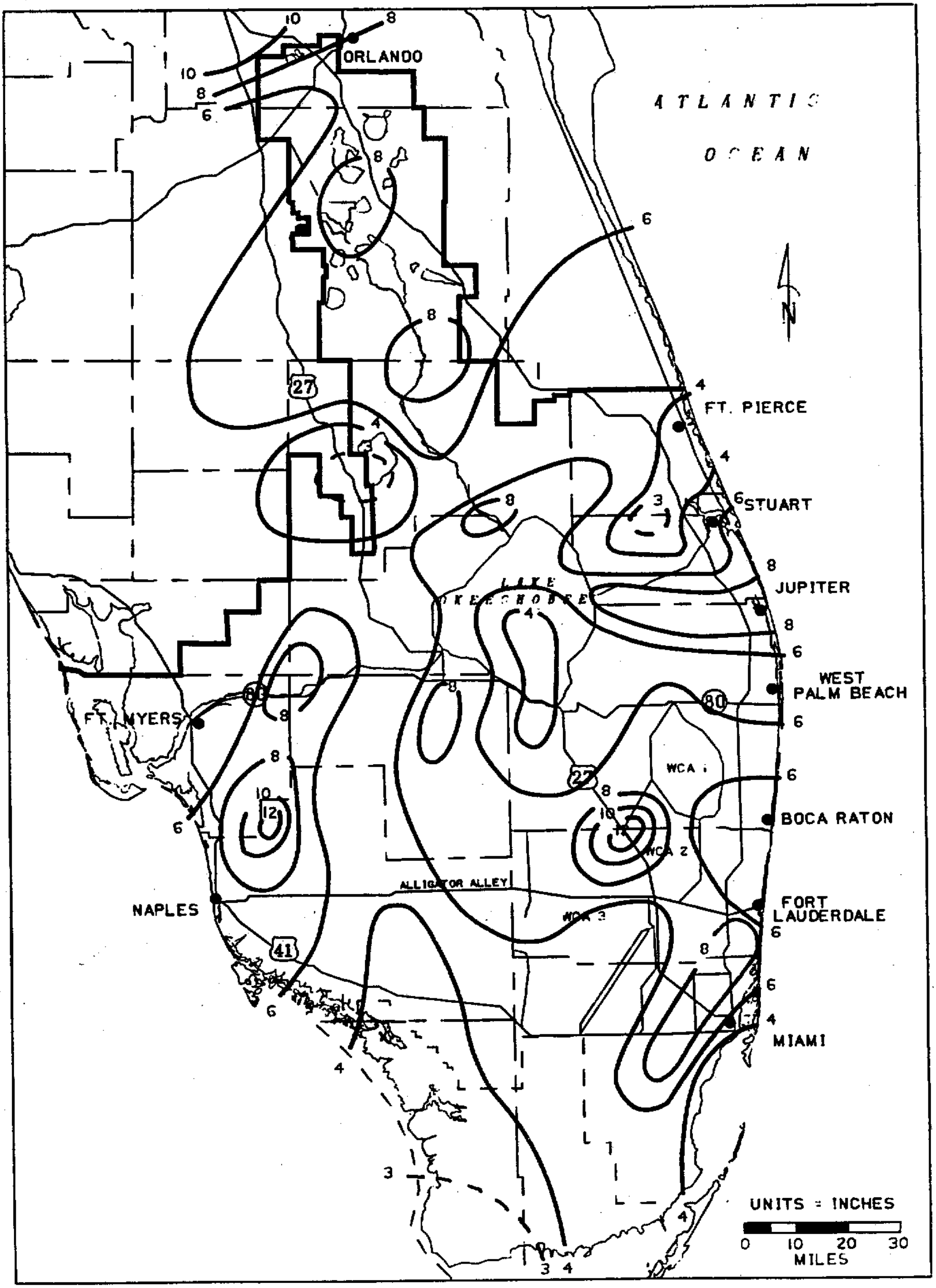


FIGURE 1. RAINFALL - JUNE, 1985

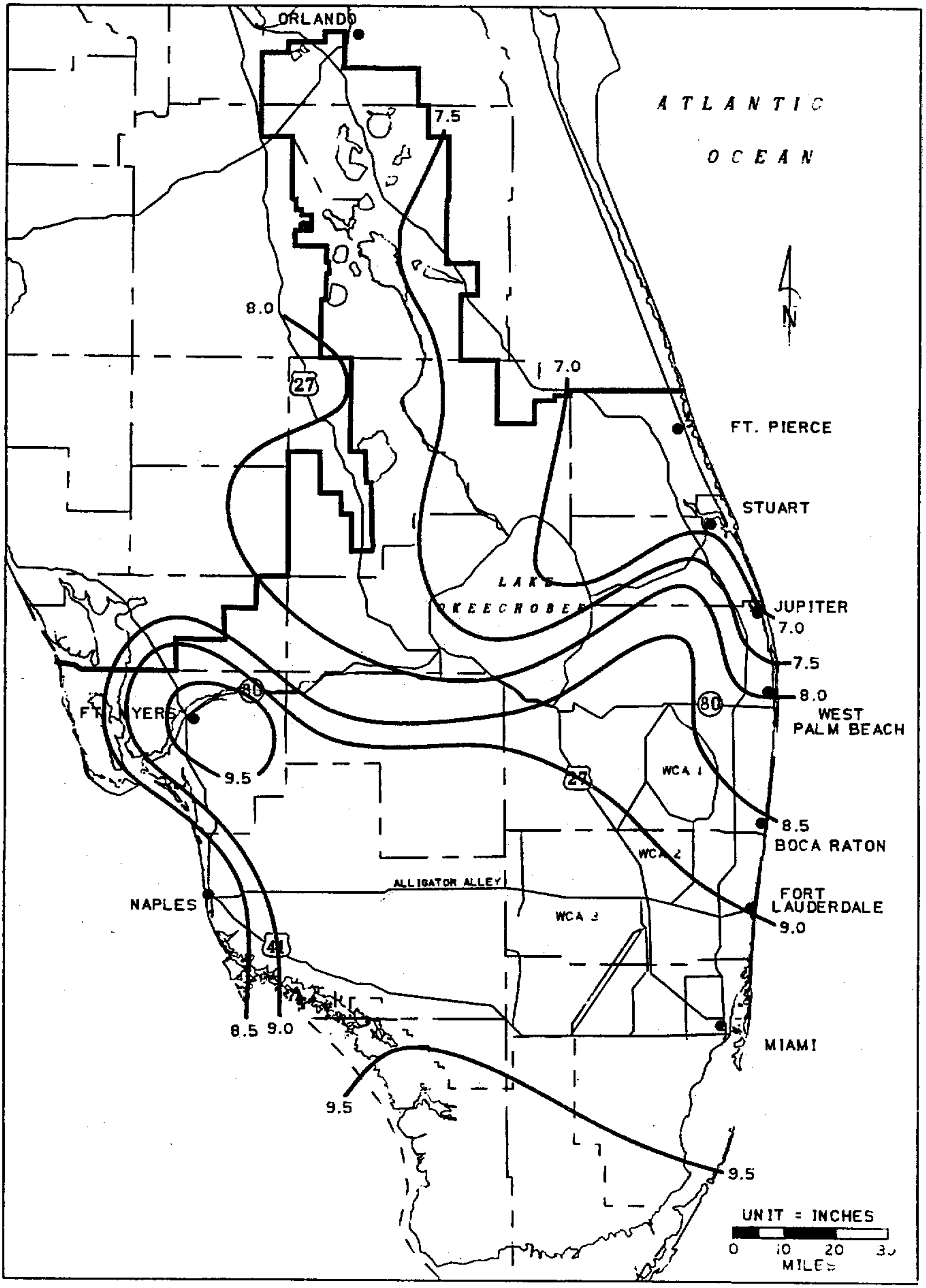


FIGURE 2. RAINFALL - NORMAL - JUNE

SURFACE WATER CONDITIONS

A. **Upper Kissimmee Basin**
The stages of most lakes in this basin have remained relatively stable since mid-June. However, stages in East and West Lake Tohopekeliga and Lake Gentry increased by almost 0.5 feet during that period. On July 8, all lakes in the Upper Kissimmee basin were about a foot below their regulation schedules.

B. **Lake Istokpoga**
Since mid-June, stages in Lake Istokpoga increased steadily, and exceeded the minimum schedule on June 22. Since the minimum schedule increases sharply after July 1, this lake was only 0.1 ft above the minimum schedule on July 8, and will probably be back below the minimum within a day or two. No releases have been made from Lake Istokpoga since May 20. Stages in canals in the Indian Prairie Area have generally risen in response to local inflow, though several reaches were still close to minimum water levels on July 8.

C. **St. Lucie County**
Rainfall in this area was nearly normal since mid-June. Water levels in the canals remained near the normal range for operation of the automatic water control structures. In early July, the settings of these structures were lowered to the wet season ranges.

D. **Lake Okeechobee and the Water Conservation Areas**
Lake Okeechobee and the three Water Conservation Areas are the major water storage components of the Central and Southern Florida Flood Control Project.

Since the beginning of the dry season, Lake Okeechobee has declined from a level of 16.29 ft. NGVD on October 1, 1984 to a level of 11.96 ft NGVD on July 1, 1985 (Figure 3). Figure 4 shows how the stage of the lake compares with the 20-year average stage from January 1, 1985 to July 8, 1985.

Figure 5 shows the total system storage (Lake Okeechobee and the Water Conservation Areas) for the period from January 1, 1985 to July 8, 1985. On January 1, 1985 the system contained approximately 2,640,000 acre feet (860 billion gallons) of surface water in storage. On July 8, 1985 the amount of stored surface water was 1,070,000 acre feet. During the month of June 1985 a total of 26,000 acre feet was gained by the system. Figure 6 shows the monthly storage change for the period from June 1, 1984 through June 30, 1985.

E. **Caloosahatchee River**
During the period since mid-June, no releases were made into the Caloosahatchee River from Lake Okeechobee. Substantial releases, however, were made to tidewater during this period due to local inflow. Salinity levels remained low, ranging from 79 to 97 mg/l.

Figure 3 LAKE OKEECHOBEE

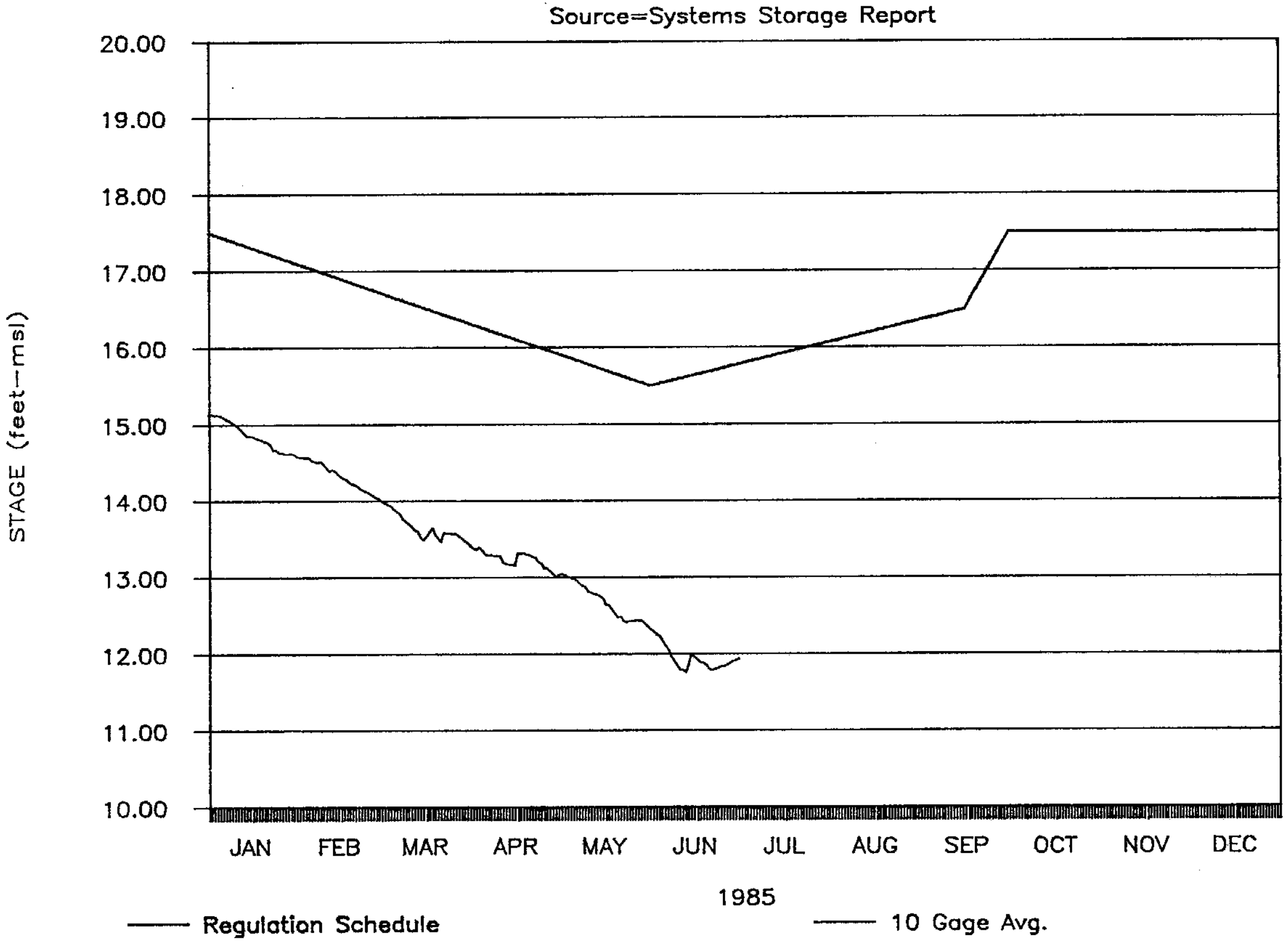


Figure 4 LAKE OKEECHOBEE STAGE

January 1,1985 to July 8,1985

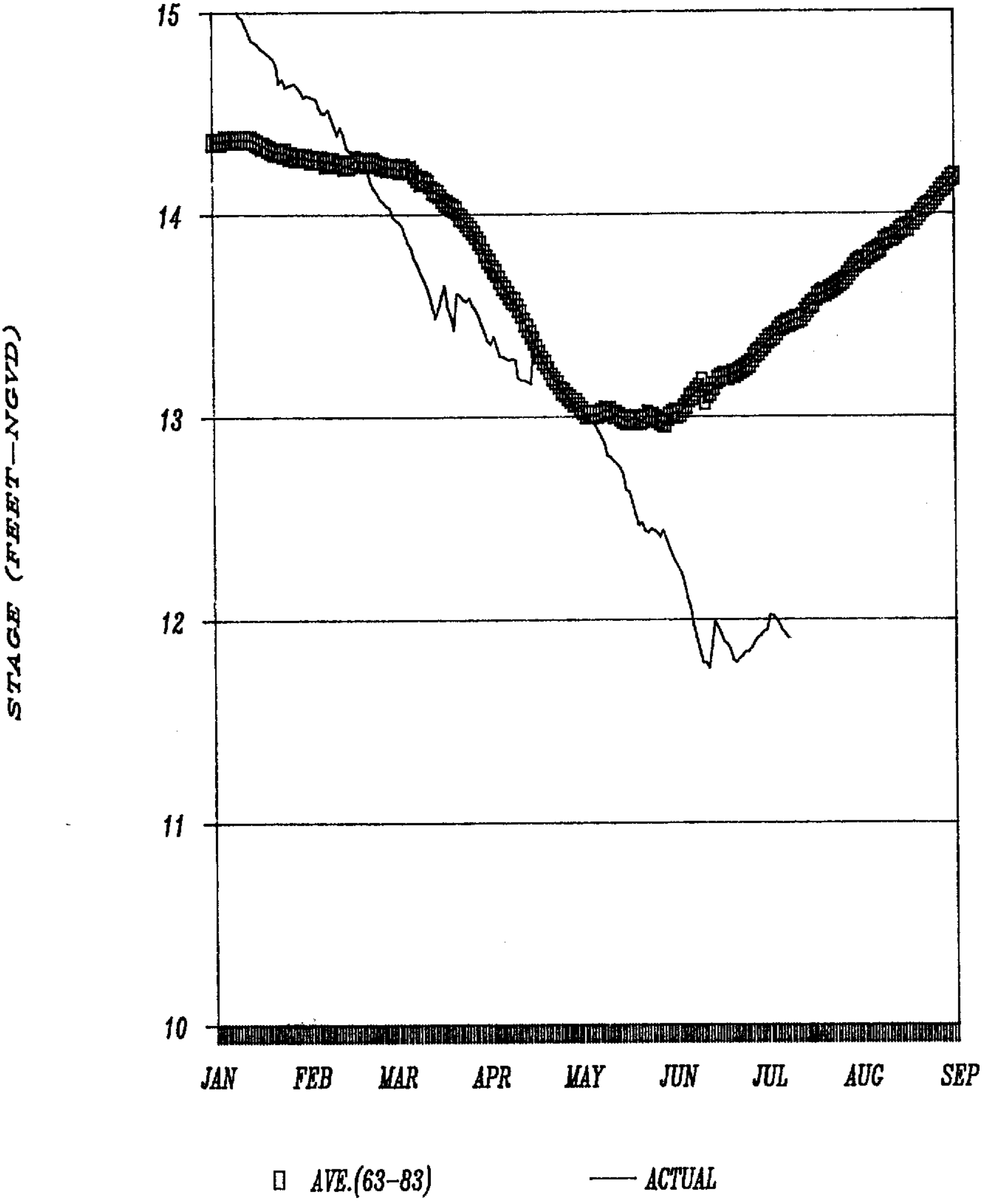


FIGURE 5. TOTAL SYSTEM STORAGE

January 1,1985 to July 8,1985

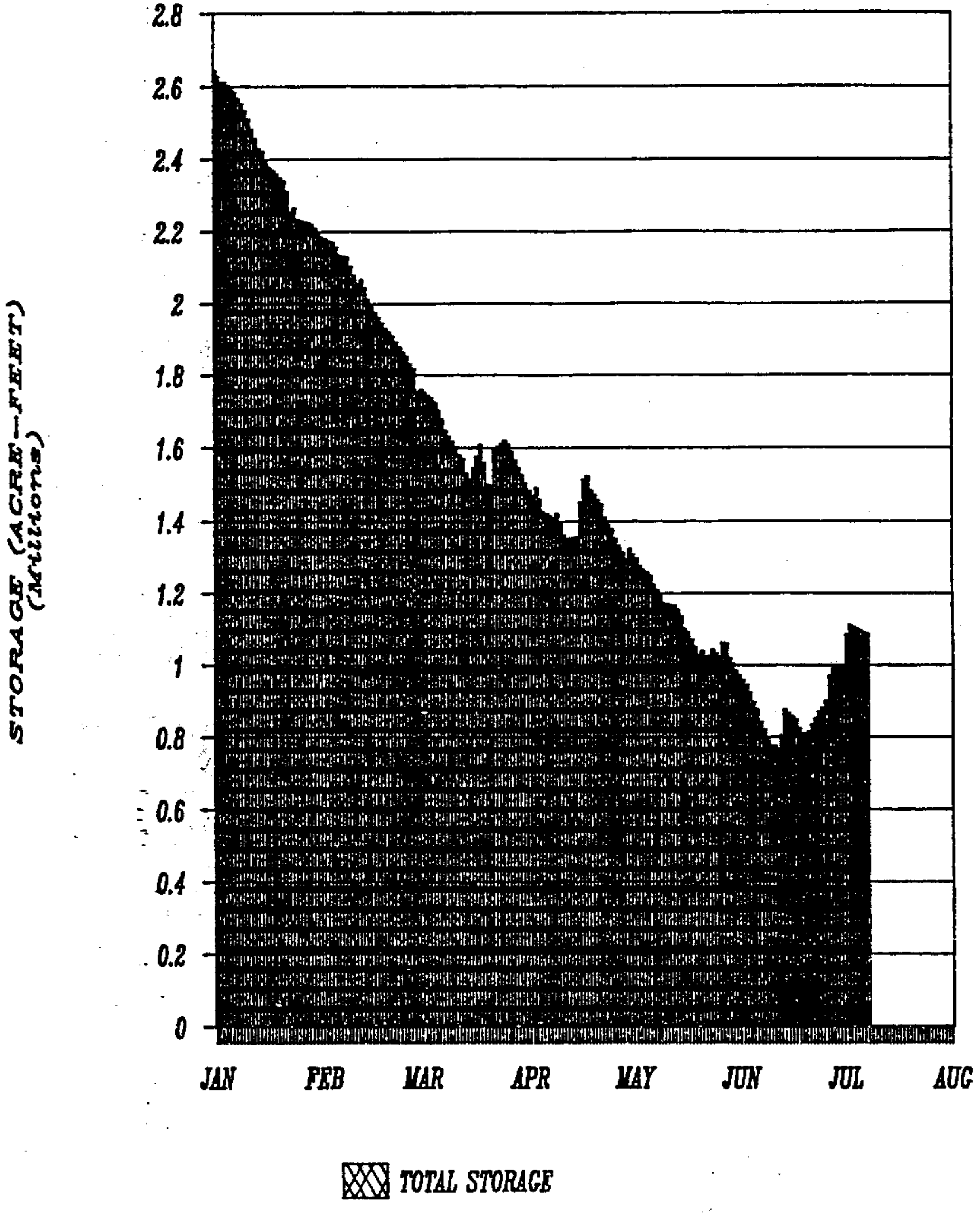
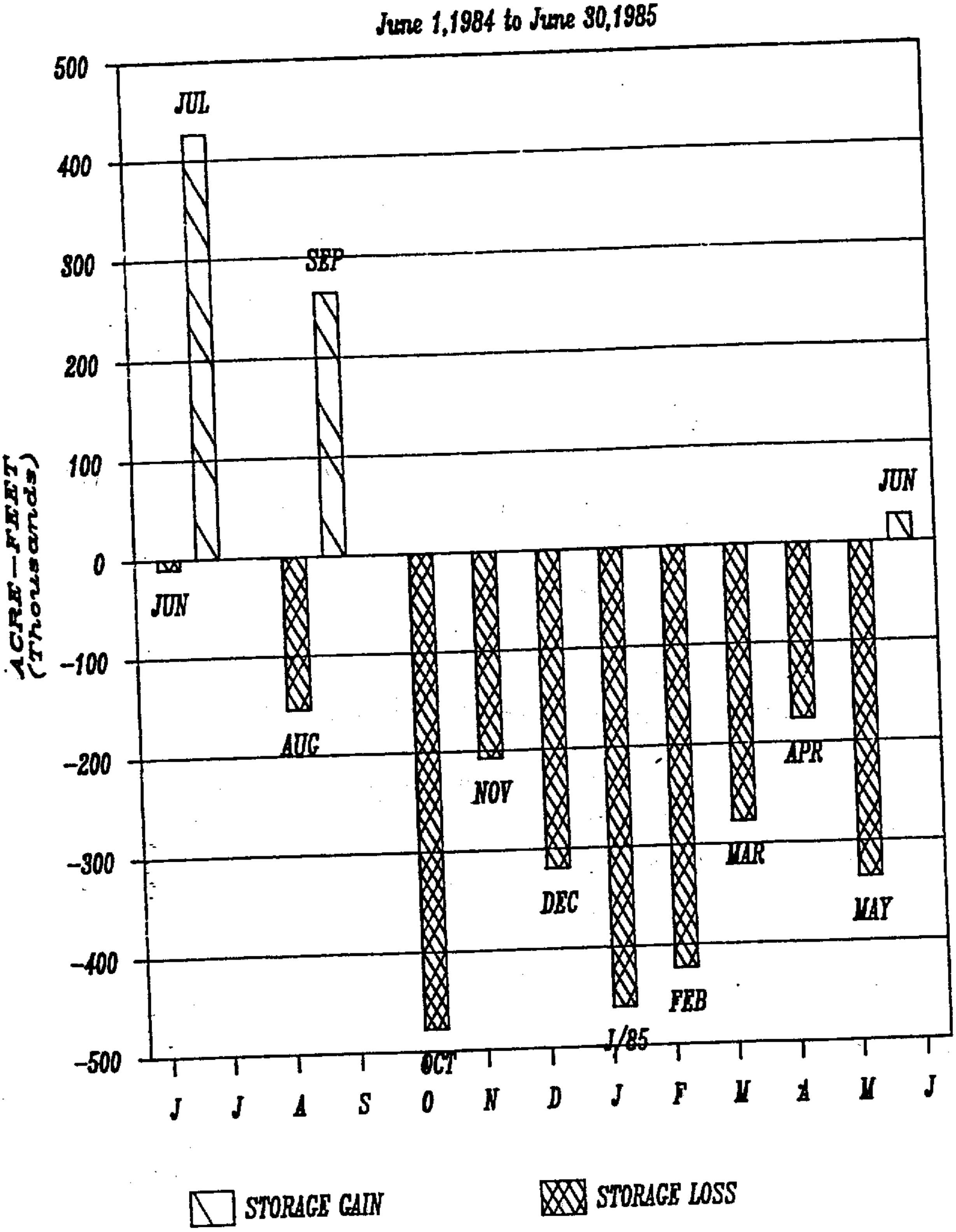


FIGURE 6. MONTHLY CHANGE IN STORAGE



III. SYSTEM WATER SUPPLY DEMANDS

Lake Okeechobee is the main water supply source for the EAA and a secondary source for the coastal basins of Dade, Broward, and Palm Beach Counties. At times the water requirements of the EAA are totally met by local rainfall over the area. Most of the time, however, water is taken from Lake Okeechobee to complete the requirements of the EAA. Note that in Figure 7, representing the lake's water budget for normal rainfall, water is supplied to the EAA every month. Figures 8, 9, and 10 (85, 75, and 65 percent of rainfall, respectively) show that during periods of less than normal rainfall, EAA demands on lake storage increase from 20 to 1000 percent.

The water supply in coastal basins is used primarily for two purposes: to meet municipal demands and to limit saltwater intrusion. When the water supply provided by local rainfall is not sufficient to satisfy these requirements, it must be supplemented from elsewhere. The first alternative for supplementing these coastal basins is taking water from the Water Conservation Areas. If there is not enough water available there, water can be taken from Lake Okeechobee. For normal rainfall, (Figure 7), the LEC will not place any demands on the lake. However, for less than normal rainfall (Figures 8-10) dry season demands cannot be met by local or conservation area supplies. As much as 85,000 acre feet might need to be transfered from the lake to the LEC in a peak month when receiving 65 percent of normal rainfall.

In periods of rainfall deficiency, often Lake Okeechobee is the only supplementary source of water supply for the EAA and the LEC. Actual evapotranspiration from the lake is one of the largest demands placed on the lake. Supplementation to the EAA and the LEC, coupled with ET, can be quite a large demand on the lake and result in fairly rapid drawing down of the lake during a drought.

Figure 7 LAKE OKEECHOBEE PROJECTED WATER BUDGET

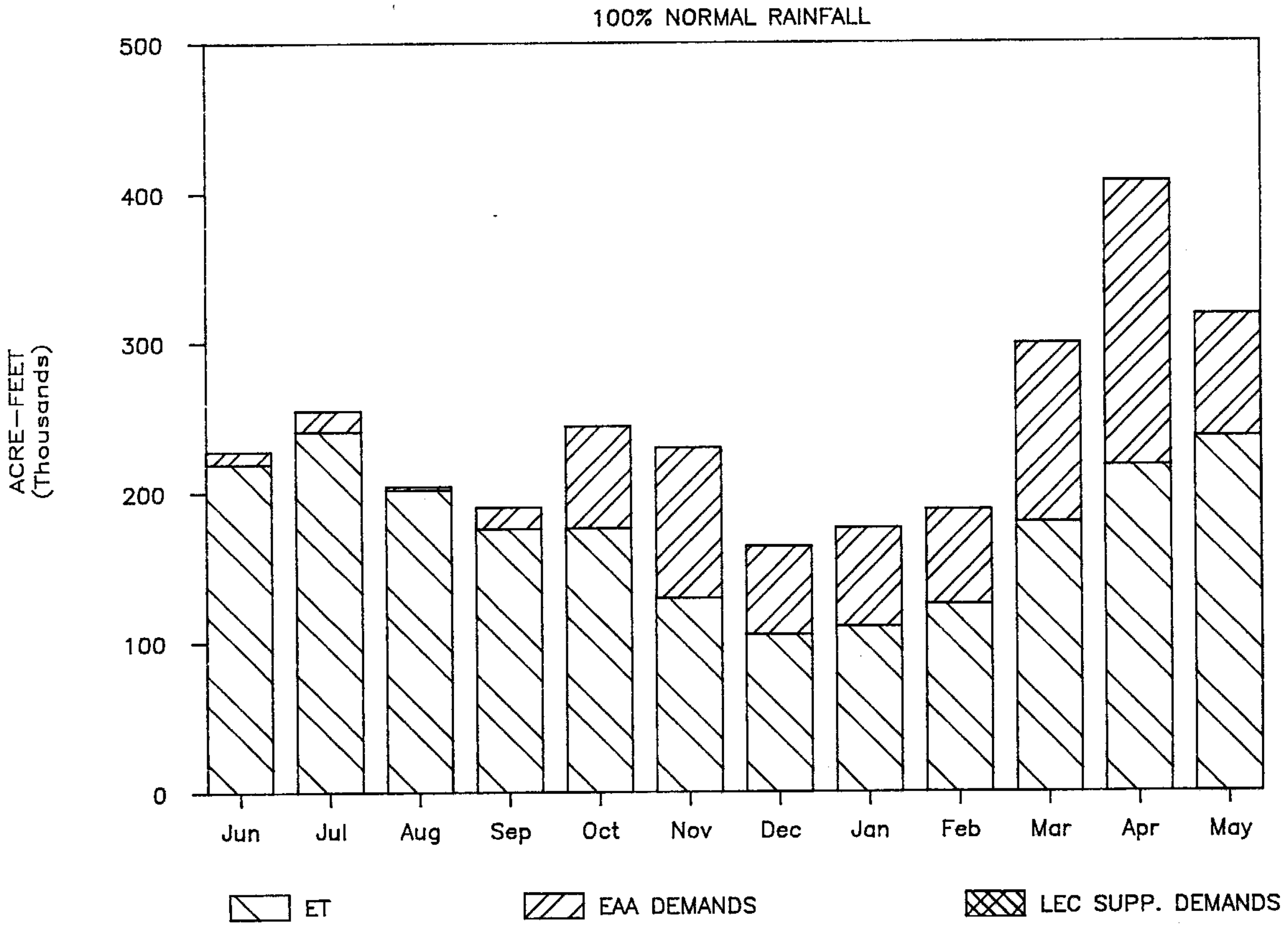


Figure 8 LAKE OKEECHOBEE PROJECTED WATER BUDGET

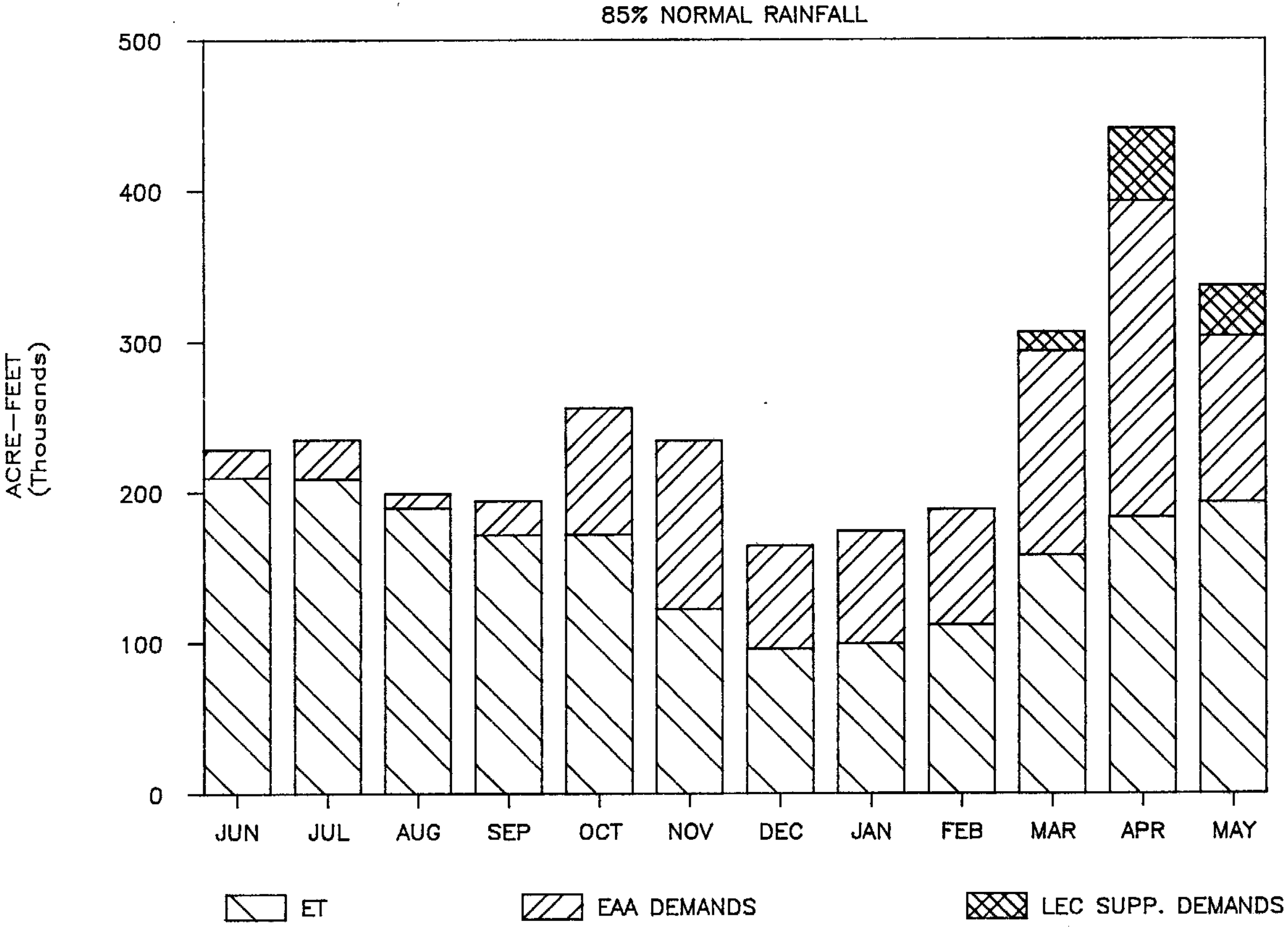


Figure 9 LAKE OKEECHOBEE PROJECTED WATER BUDGET

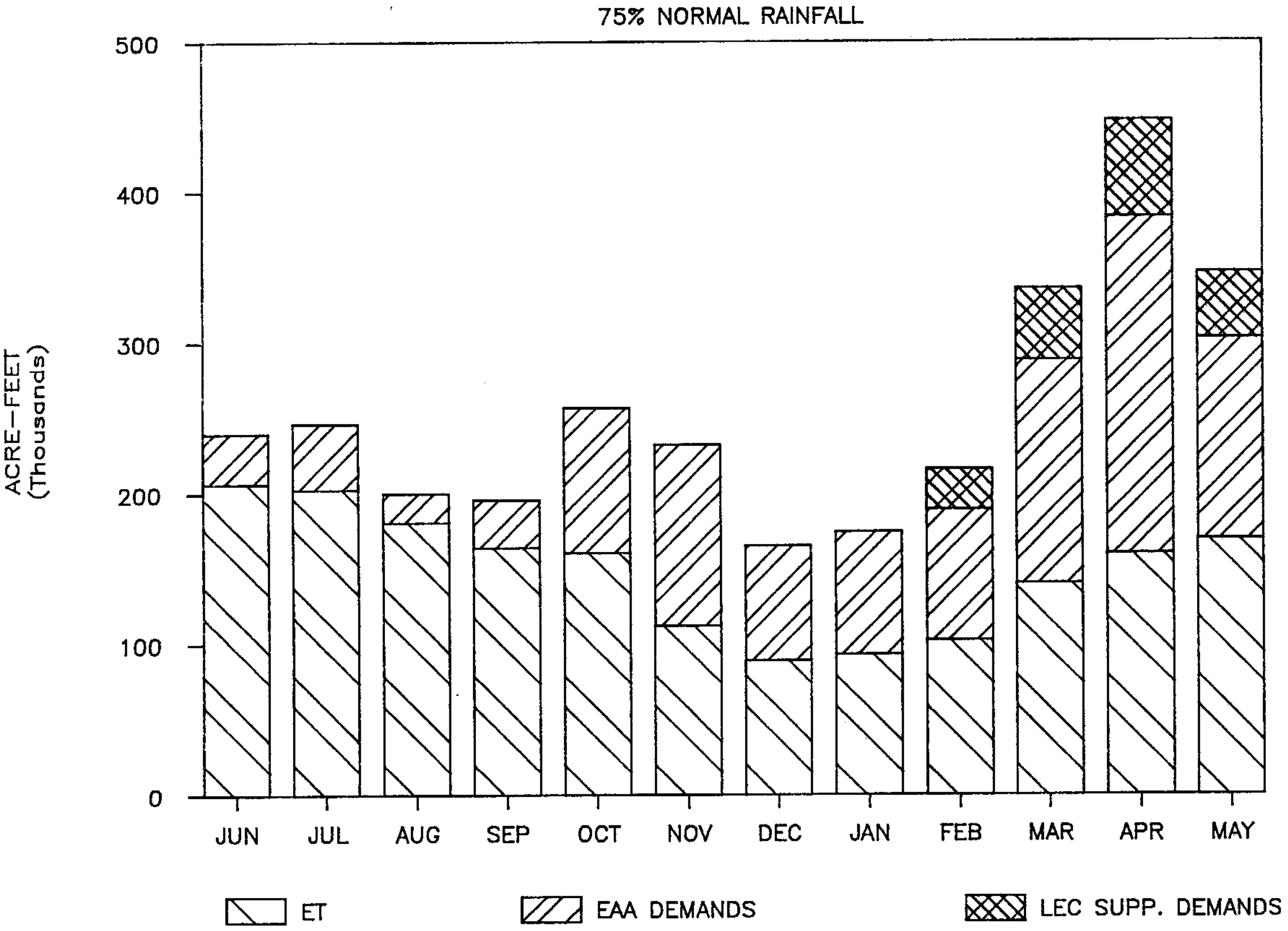


Figure 10 LAKE OKEECHOBEE PROJECTED WATER BUDGET

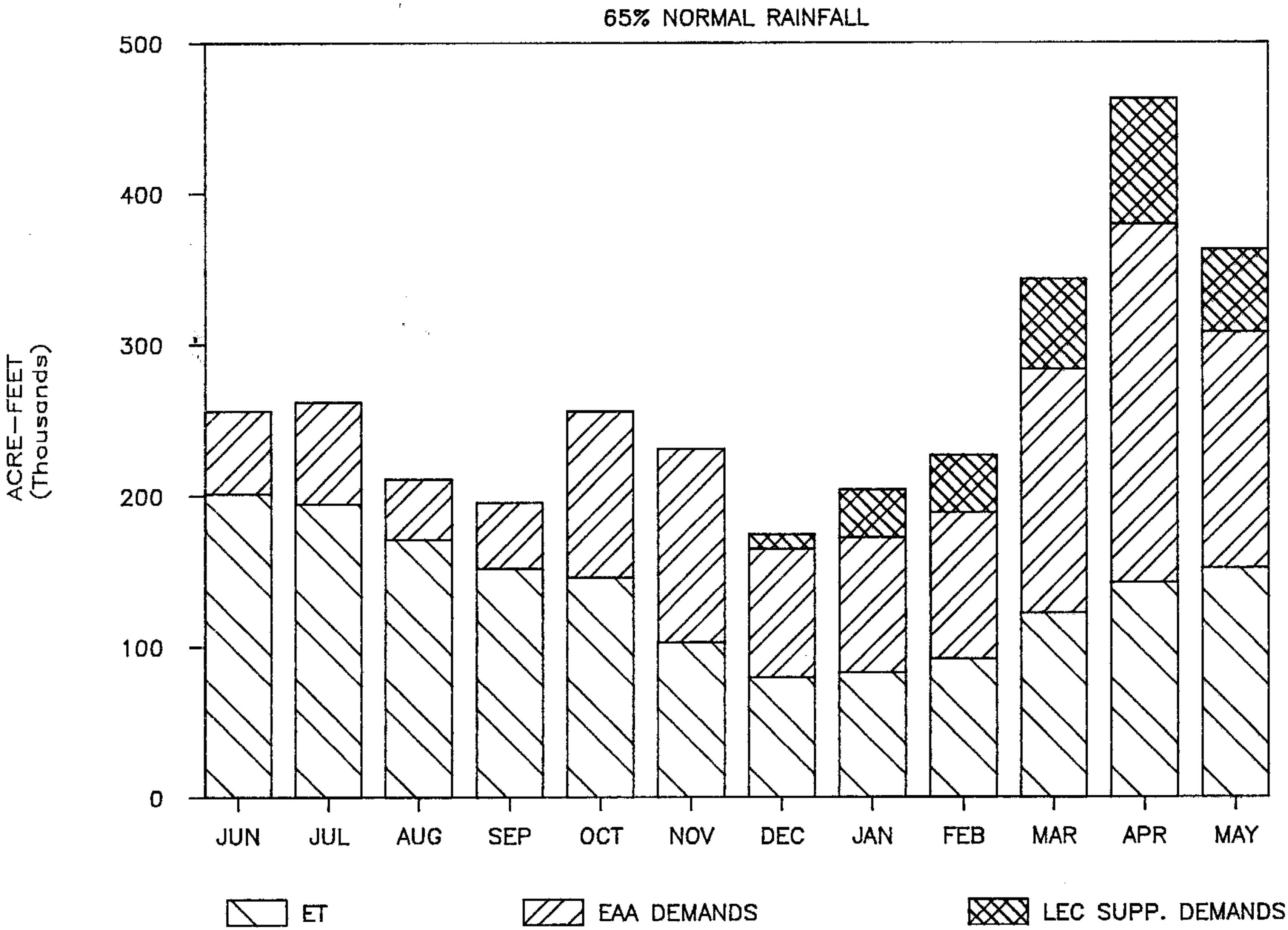


Figure 11 LAKE OKEECHOBEE

WET SEASON GAIN

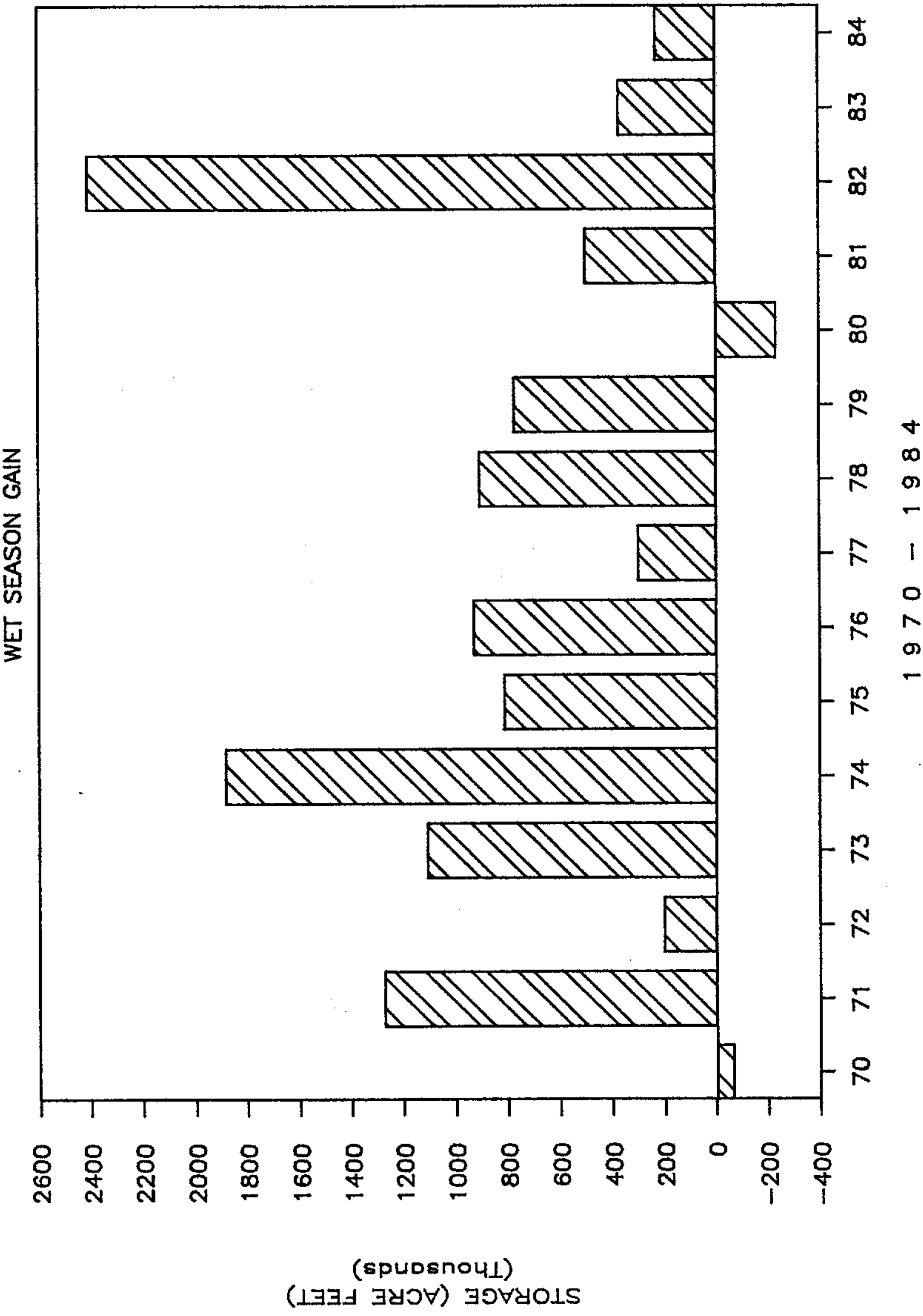
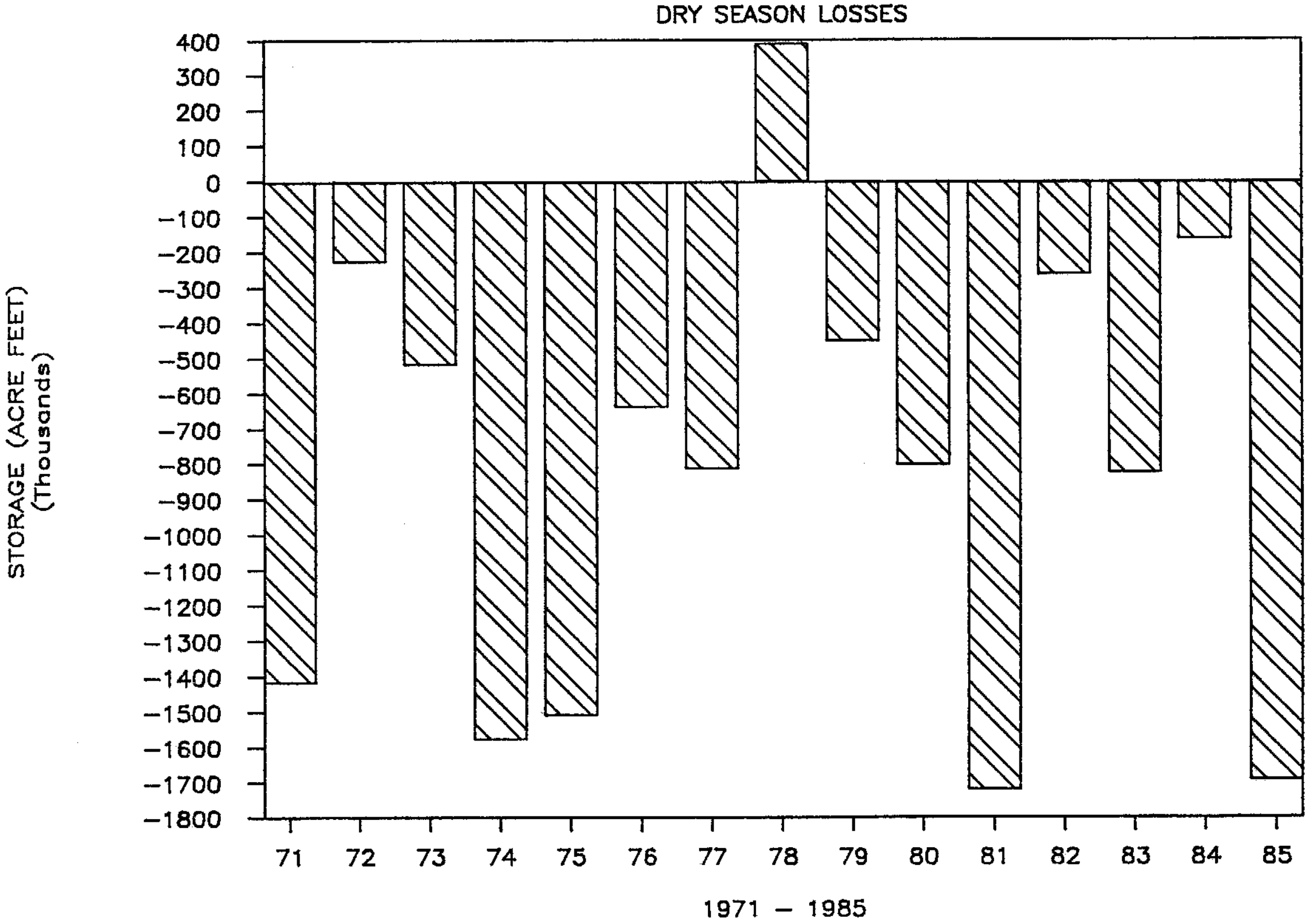


Figure 12 LAKE OKEECHOBEE



IV. RESULTS OF MODELING EFFORTS

Projections indicate that with normal rainfall the lake stage at the beginning of the next dry season will be at 14.04 ft which is 3.5 ft below regulation. The lake stage has been below 14.0 ft NGVD four times in the last 15 years. During the dry season the lake loses about 3 ft of water under normal rainfall conditions, and 4 ft or more under less than normal conditions. By the end of the next dry season, the lake stage could easily reach 11.0 ft MGVD with normal rainfall or maybe less than 10 ft NGVD with less than normal rainfall. These numbers indicate that the Lake Okeechobee basin undoubtedly will be under a water shortage condition next spring unless greater than normal rainfall occurs during the remainder of the wet season.

The nature of supply and demand in this system is such that the majority of the supply comes in the wet season and enough has to be stored to meet demands during the dry season. Since Lake Okeechobee is a major storage component of the system, predicted deficits in supply can be reduced or eliminated by augmenting storage in the lake. Storage augmentation is possible only when excess water exists and where it can be captured. Primarily, this will occur in the wet season in the EAA. If wet season excess is not stored when it cocurs, it will not be available later.

Under the present IAP, part of the water which would have normally been backpumped to the lake goes to WCA-2A and WCA-3A. Some of this water is lost in additional evapotranspiration or regulatory releases to the Everglades National Park or to the coast. The Water Conservation Areas are not as efficient as the lake for water storage, thus when water shortage conditions are predicted, the most efficient place to store excess wet season runoff is in Lake Okeechobee.

In 1974 the District suggested the use of cumulative reverse supply and demand curves to analyze water shortage conditions. This procedure involves determining expected monthly storage changes in Lake Okeechobee (all inflows, rainfall, and losses, except water supply releases). Also, estimate the monthly demands for water supply from Lake Okeechobee. These values are accumulated backwards in time ("backsummed") from May 31. Then, depending on one's projection (optimistic or pessimistic) of supply and demand, the degree of shortage to be managed can be determined. The same scheme was followed in developing the current methodology whch is presented on the following pages.

METHODOLOGY TO DETERMINE LAKE OKEECHOBEE OPERATIONAL LIMITS

1. Estimate monthly Lake Okeechobee change in storage under normal rainfall conditions.

$$\Delta S = RF + INFLOWS - ET - SEEPAGE$$

2. Estimate monthly demands in Lake okeechobee under normal rainfall conditions

3. Backsum changes in storage in Lake Okeechobee as estimated in 1 from end of dry season (May 31) to desired month. (TΔSI)

4. Backsum demands as estimated in 2 from end of dry season to desired month (TDI).

5. Determine required storage in Lake Okeechobee at the beginning of each month to meet demands under normal rainfall conditions and to end the dry season (May 31) at stage of 11.0'.

$$SRI = T_{DI} + S(11.0') - T\Delta S_I$$

6. Convert required storage to required stage using storage stage curve.

7. Estimate monthly Lake Okeechobee change in storage under one in five years frequency rainfall conditions.

$$\Delta S = RF + INFLOWS - ET - SEEPAGE$$

8. Estimate monthly demands in Lake Okeechobee under one in five years frequency rainfall conditions.

9. Backsum changes in storage in Lake Okeechobee as estimated in 7 from end of dry season (May 31) to desired month. ($T\Delta S_I$)

10. Backsum demands as estimated in 8 from end of dry season to desired month (TD_I)

11. Determine required storage in Lake Okeechobee at the beginning of each month to meet demands under one in five years frequency rainfall conditions and to end of the dry season (May 31) at stage of 11.0'.

12. Convert required storage to required stage using storage stage curve.

METHODOLOGY TO DETERMINE LAKE OKEECHOBEE OPERATIONAL LIMITS

1. **Estimate monthly Lake Okeechobee change in storage under normal rainfall conditions.**

$$\Delta S = RF + INFLOWS - ET - SEEPAGE$$

FIGURE 13 UPPER KISS.–KISS.–FEC BASIN

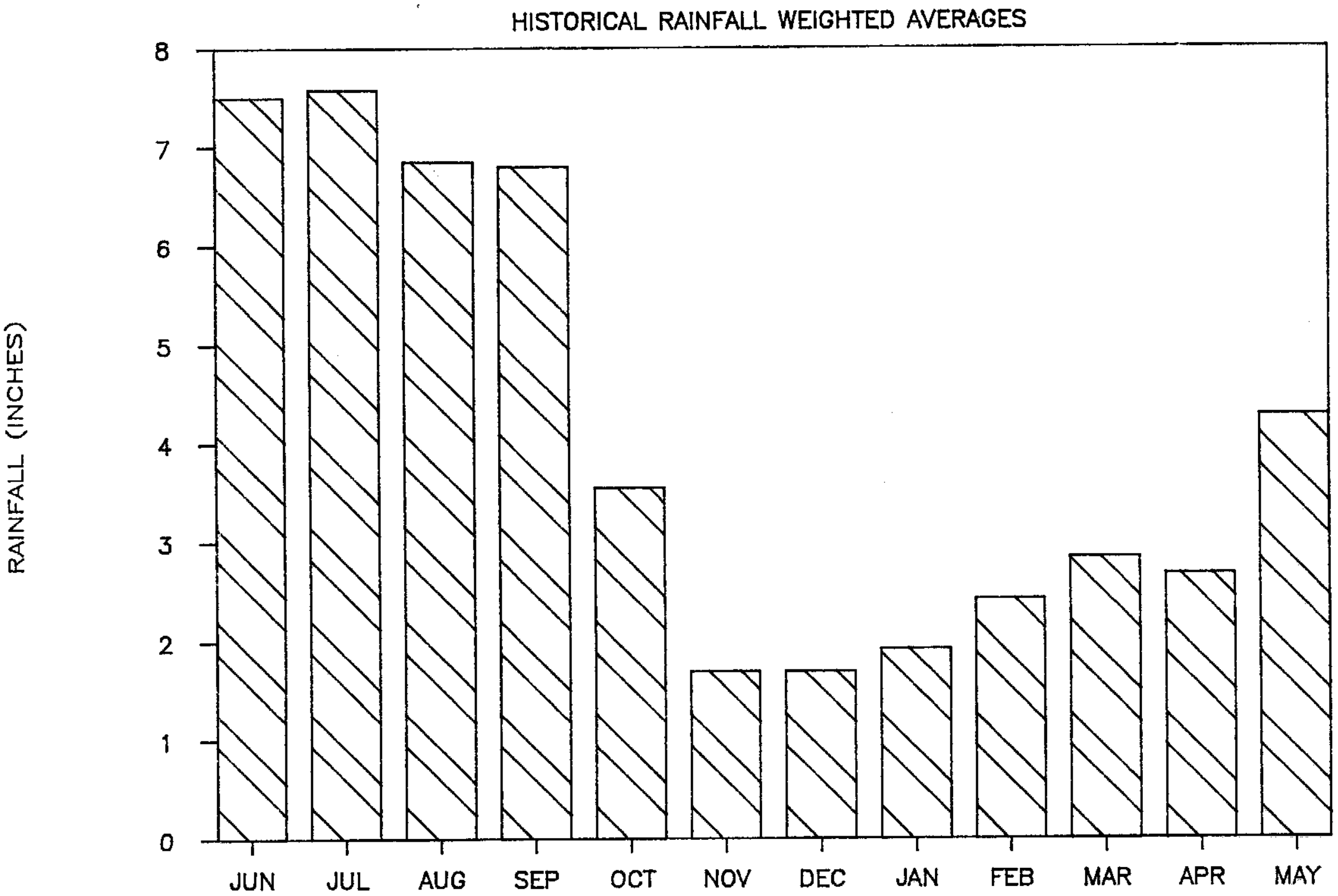


FIGURE 14 LAKE OKEECHOBEE—WCA1—WCA2—WCA3—EAA

HISTORICAL RAINFALL WEIGHTED AVERAGES

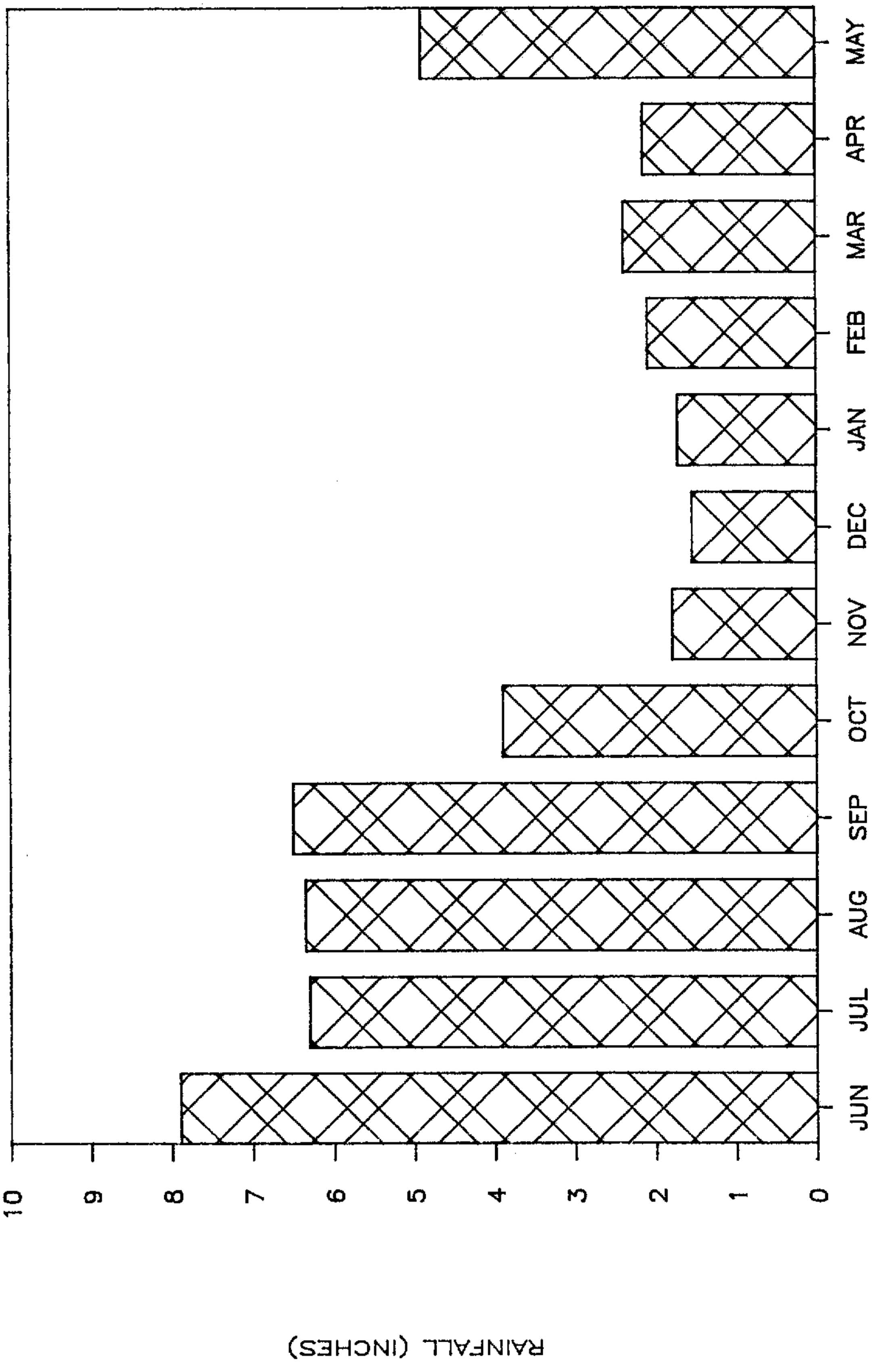
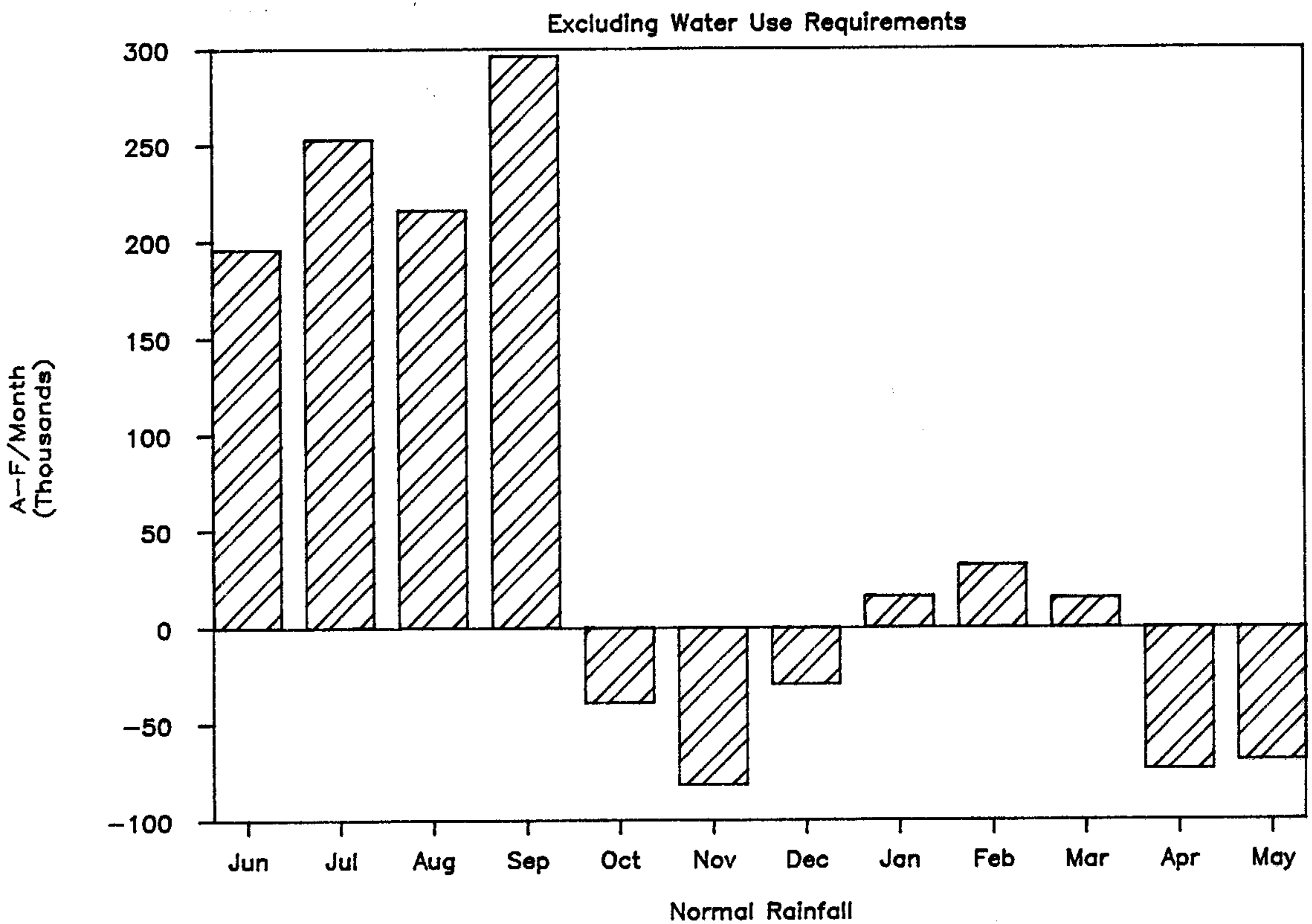


FIGURE 15 Lake Okeechobee Change in Storage

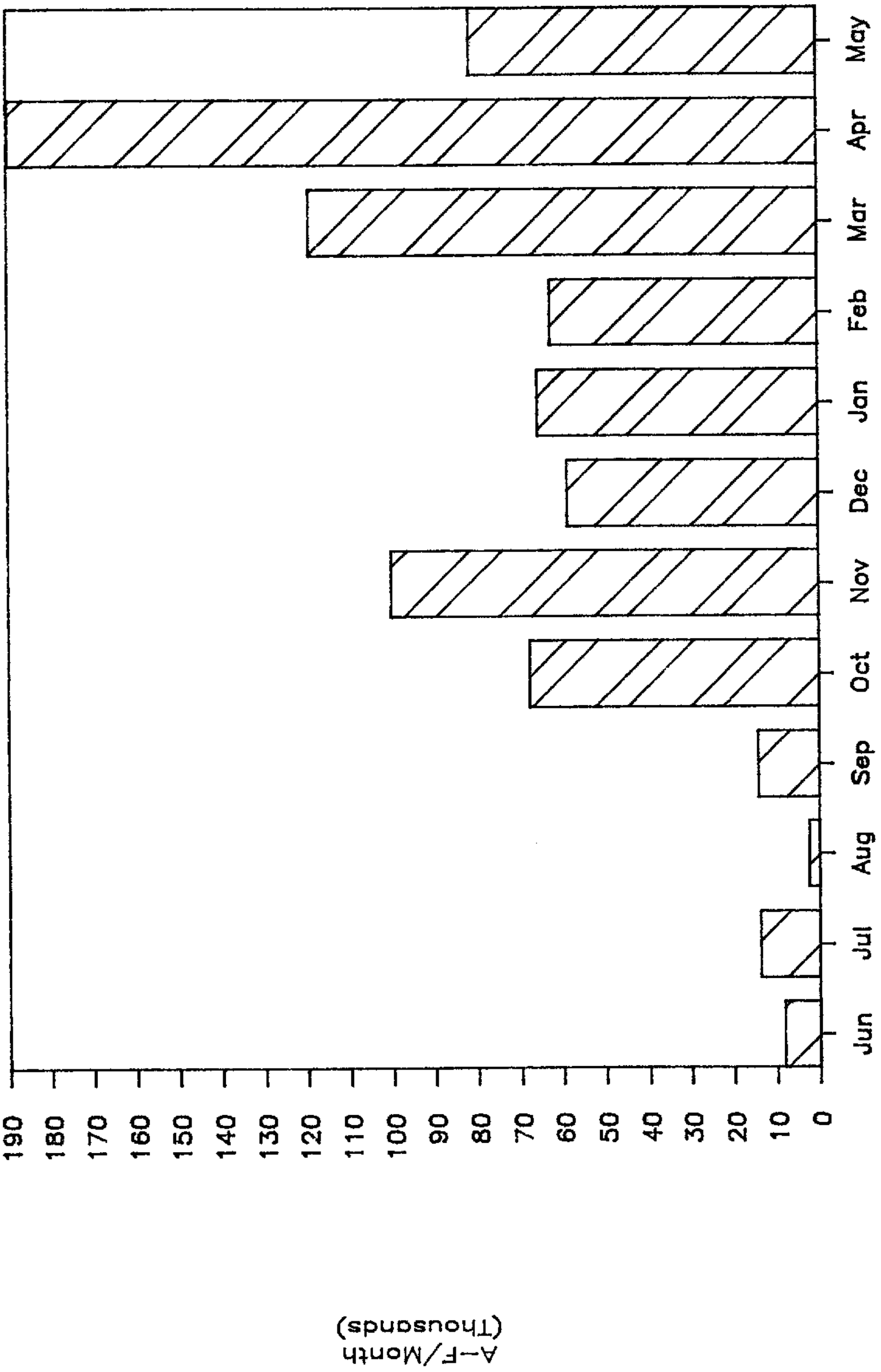


METHODOLOGY TO DETERMINE LAKE OKEECHOBEE OPERATIONAL LIMITS

2. Estimate monthly demands in Lake okeechobee under normal rainfall conditions.

Figure 16 Lake Okeechobee Demands

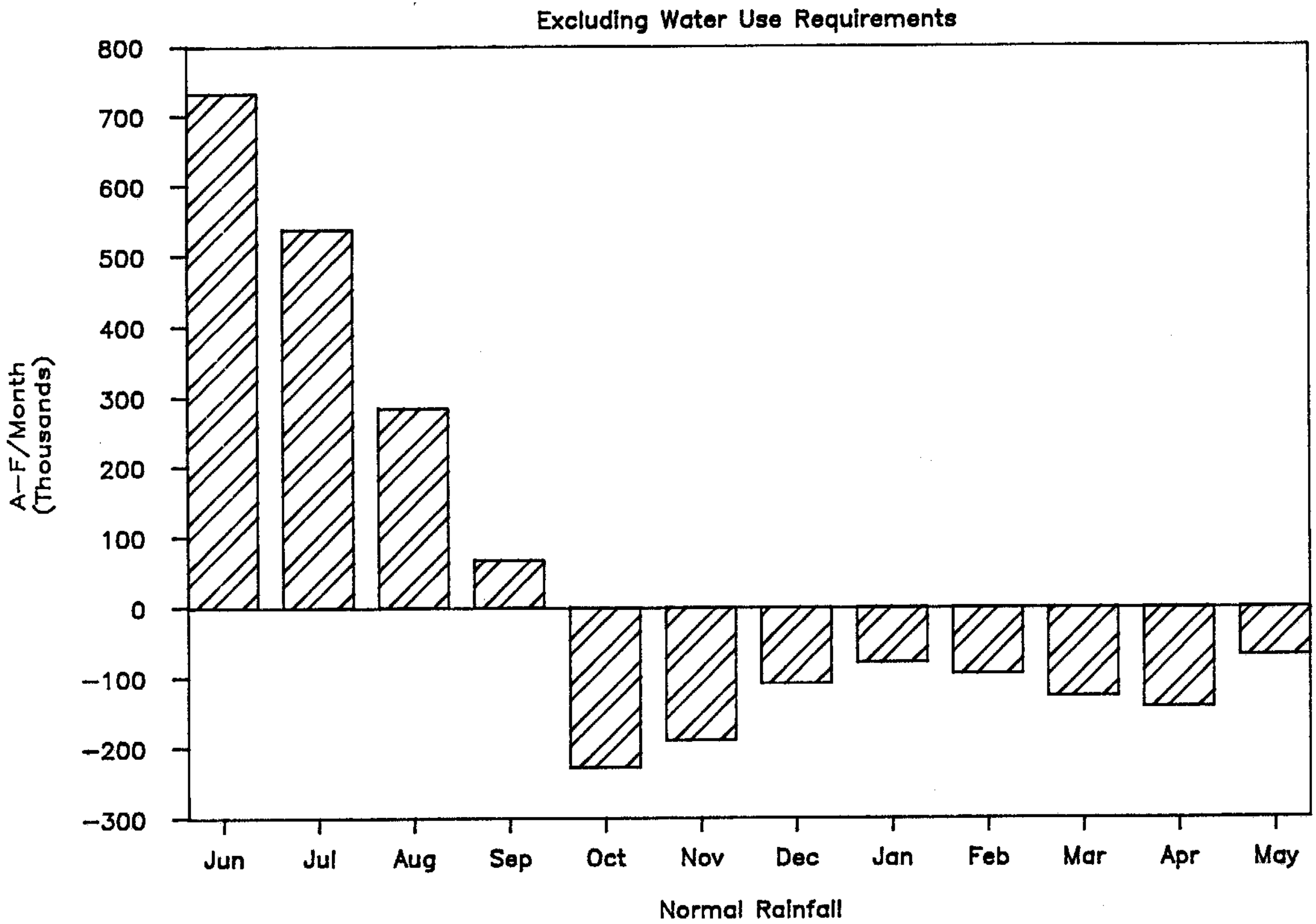
Normal Rainfall



METHODOLOGY TO DETERMINE LAKE OKEECHOBEE OPERATIONAL LIMITS

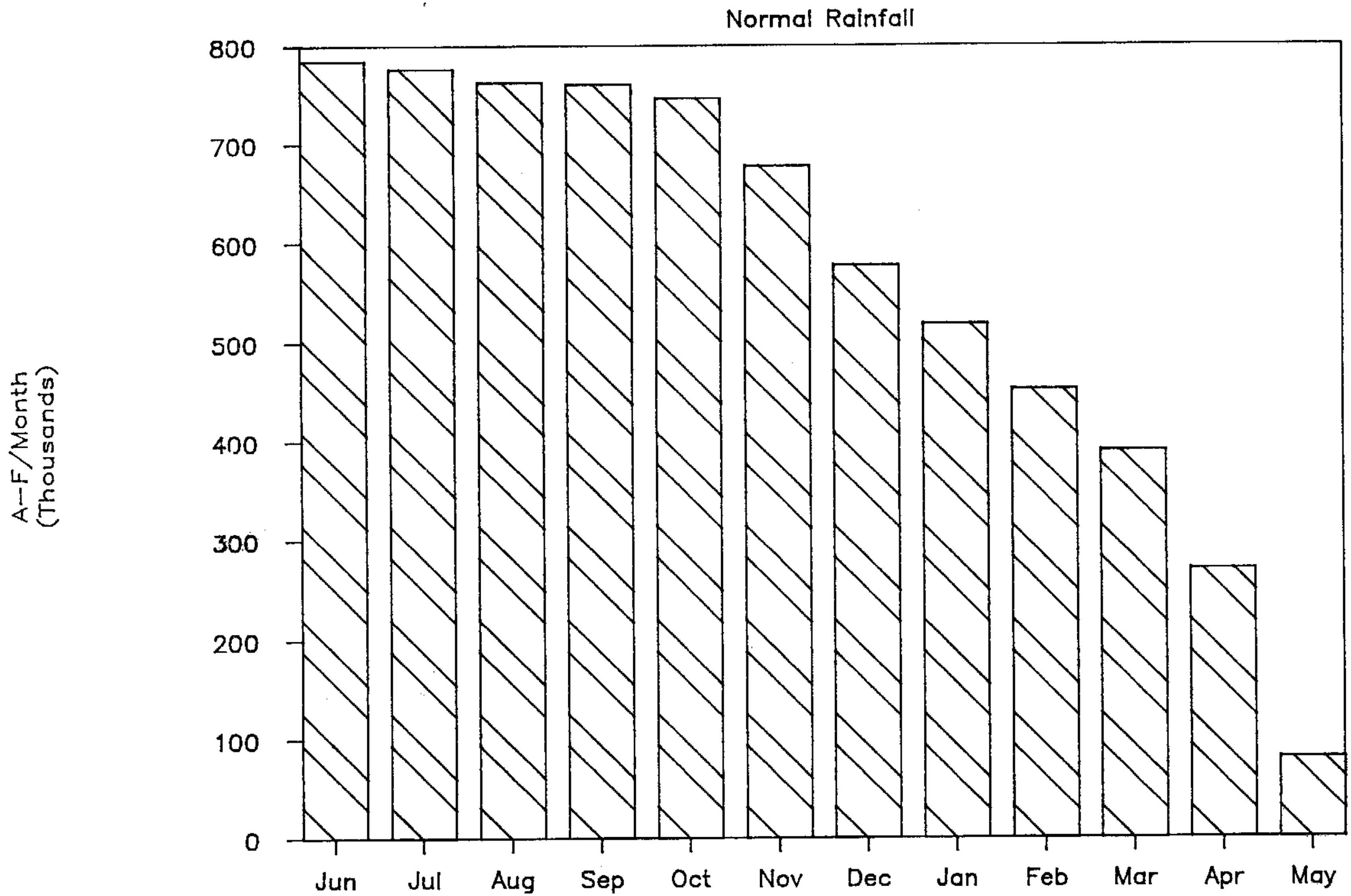
3. **Backsum changes in storage in Lake Okeechobee as estimated in 1 from end of dry season (May 31) to desired month.** ($T\Delta S_I$)

Figure 17 Lake Okeechobee Change in Storage (Backsummed)



4. Backsum demands as estimated in 2 from end of dry season to desired month (TD_I).

Figure 18 Lake Okeechobee Demands (Backsummed)



METHODOLOGY TO DETERMINE LAKE OKEECHOBEE OPERATIONAL LIMITS

5. **Determine required storage in Lake Okeechobee at the beginning of each month to meet demands under normal rainfall conditions and to end the dry season (May 31) at stage of 11.0′.**

$$SRI = T_{DI} + S(11.0') - T\Delta S_I$$

Figure 19 Lake Okeechobee Required Storage

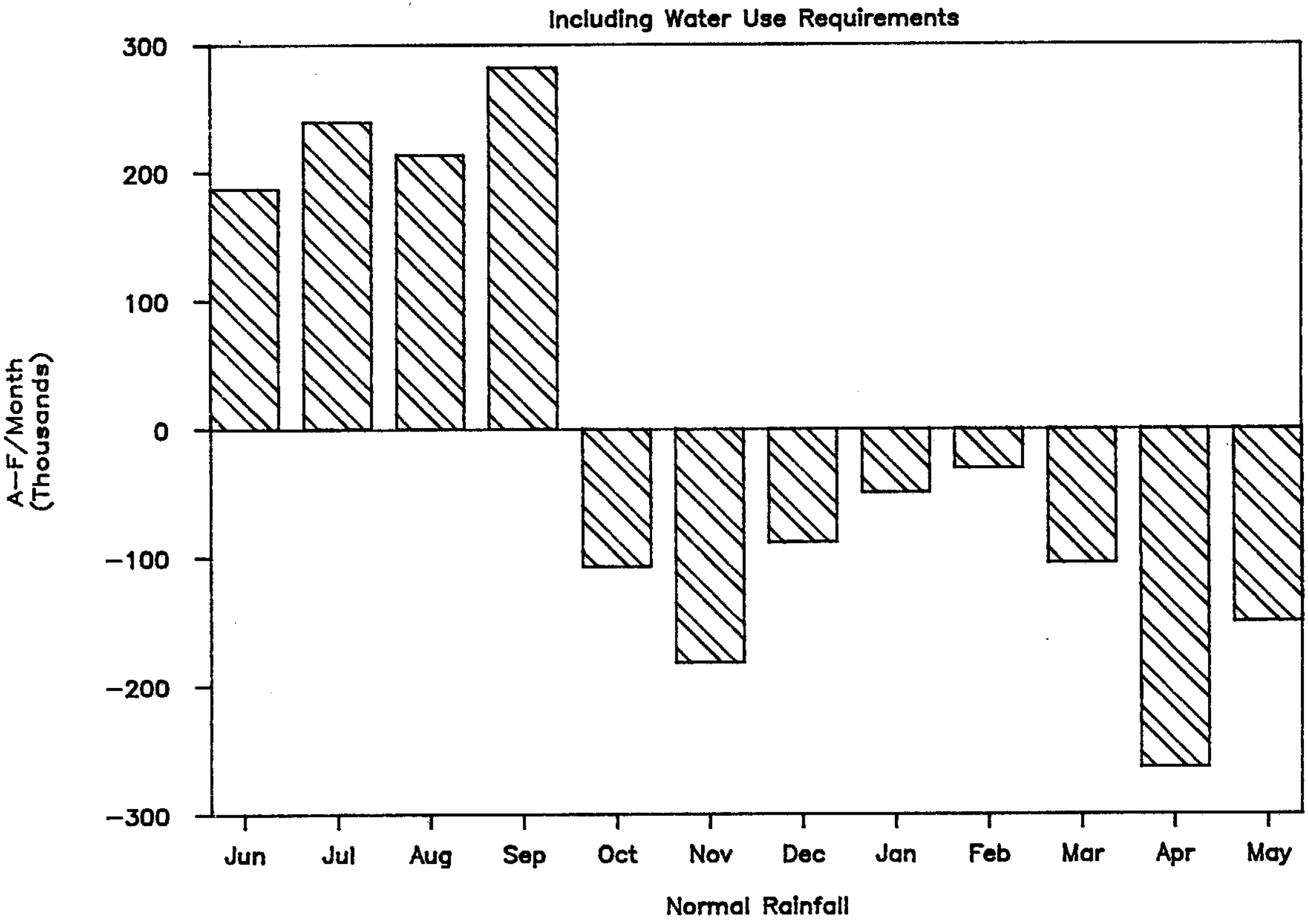


Figure 20 Lake Okeechobee Required Storage (Backsummed)

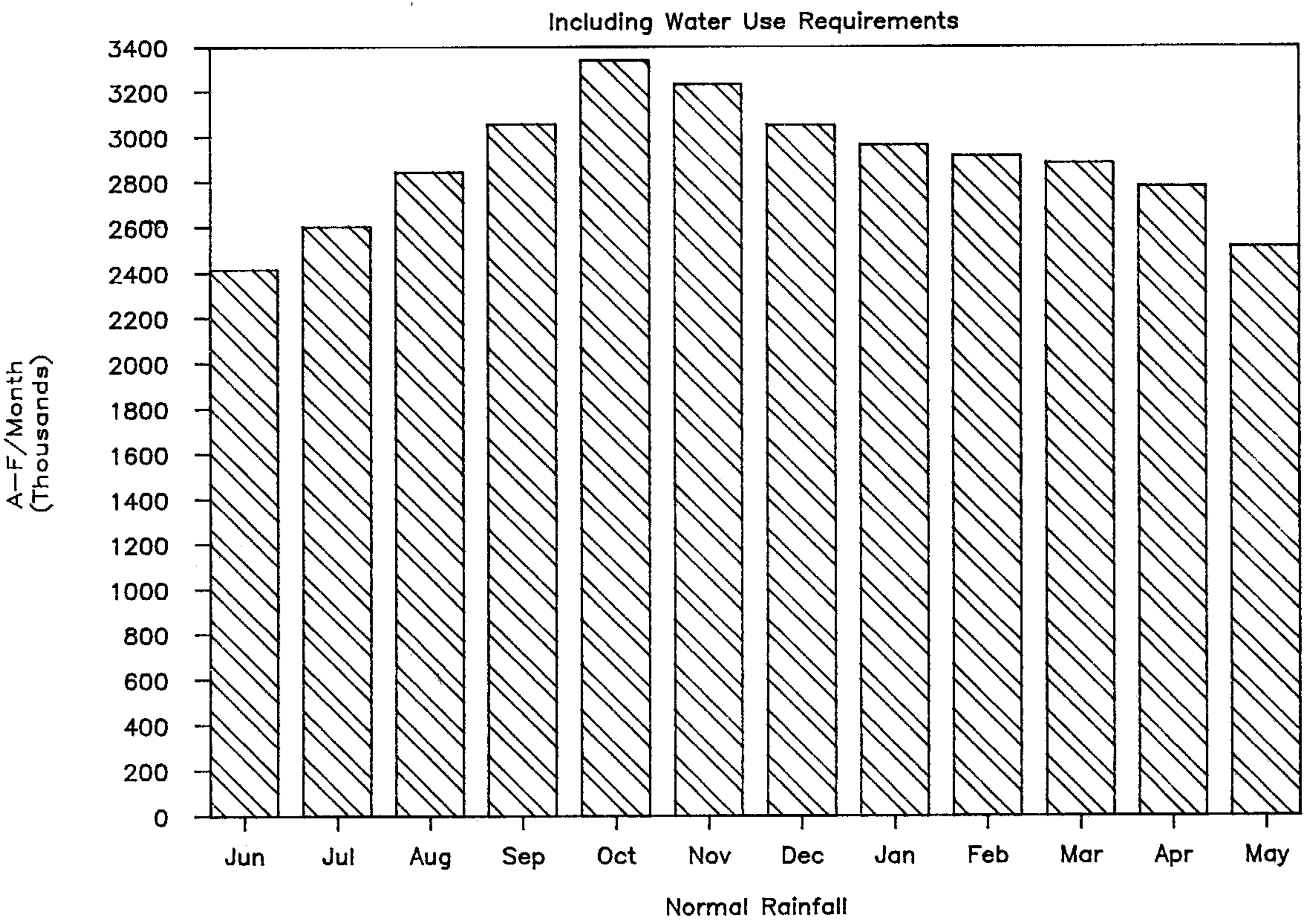


Figure 21 HISTORICAL STAGES

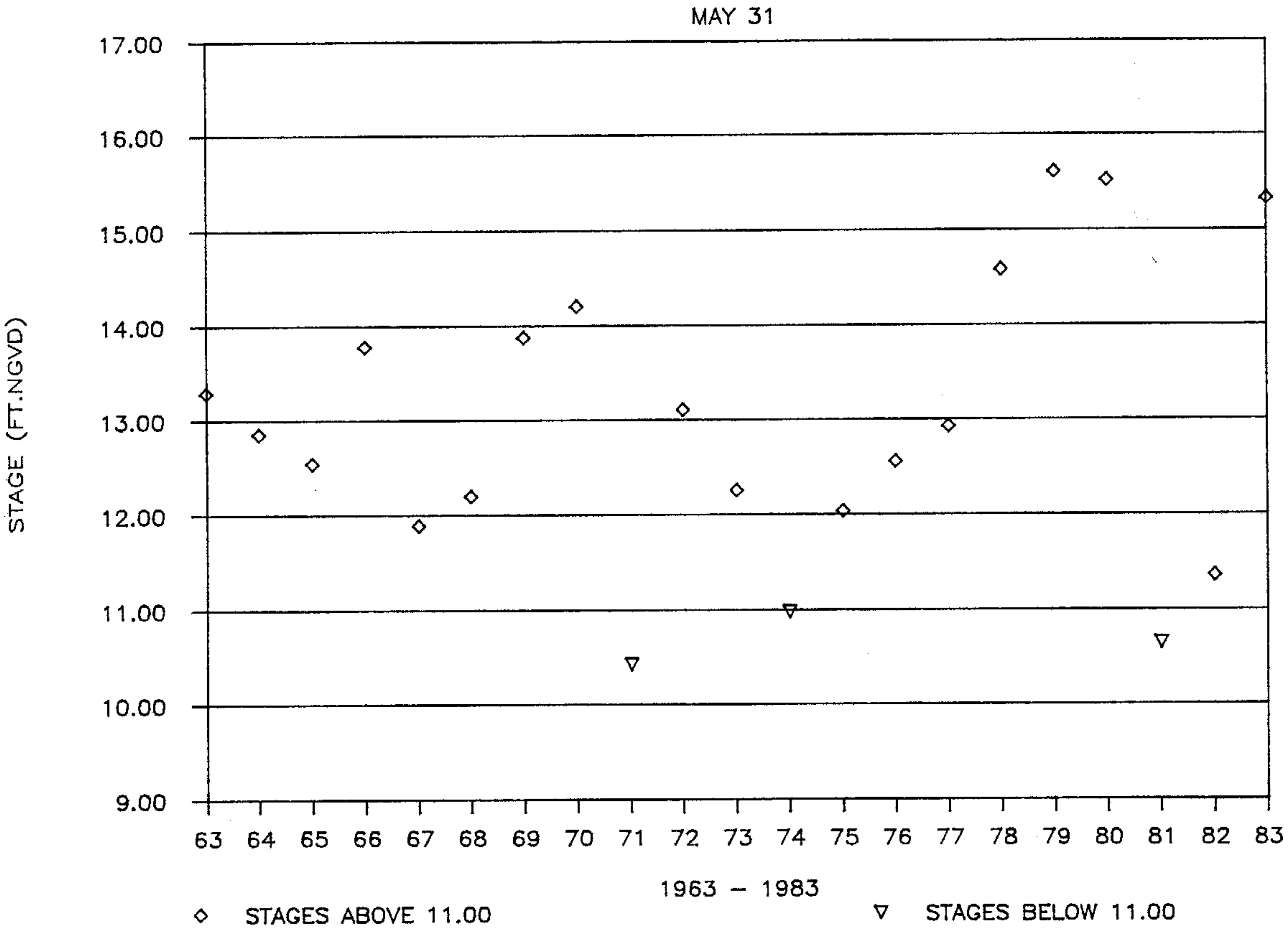
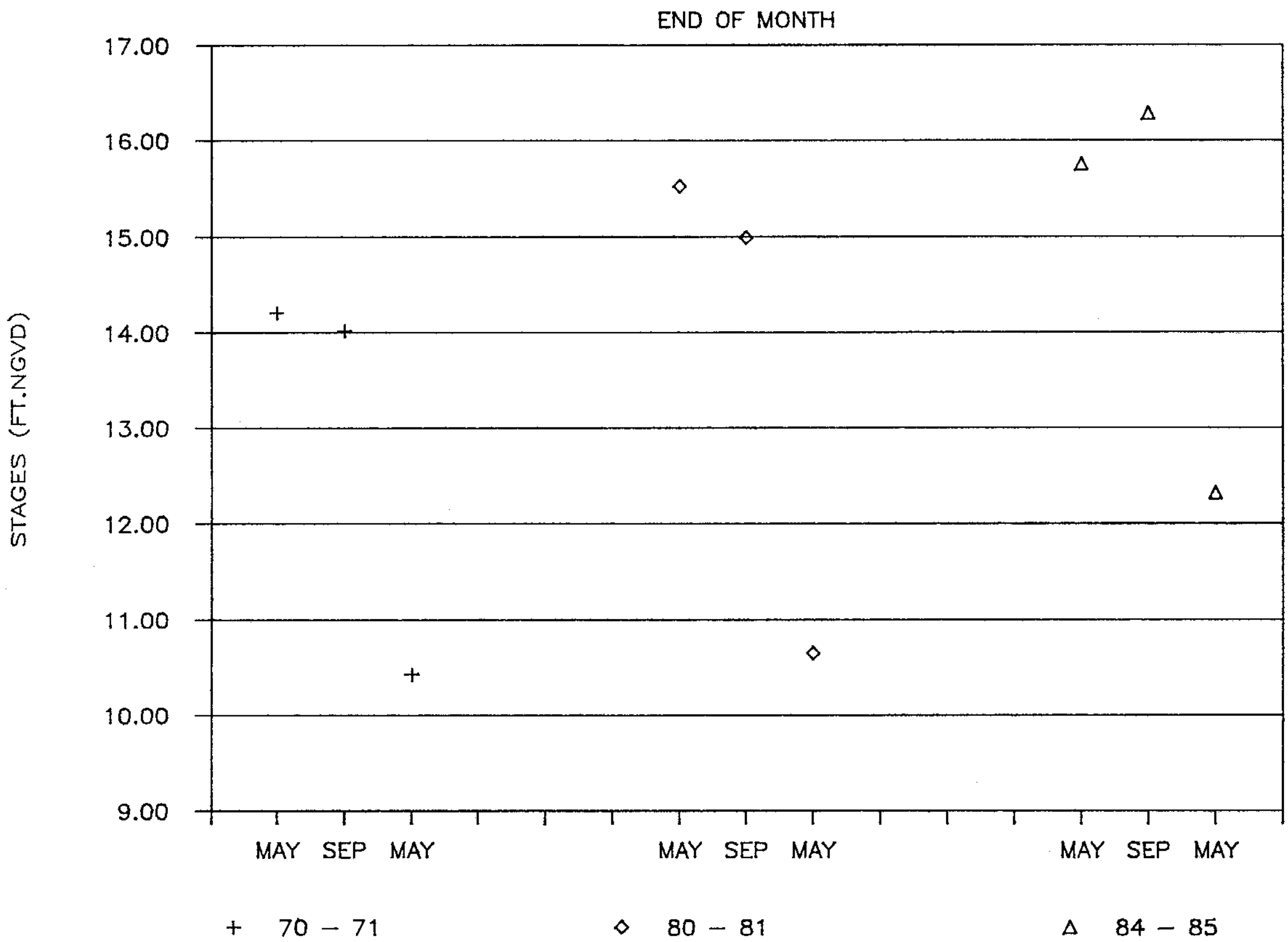
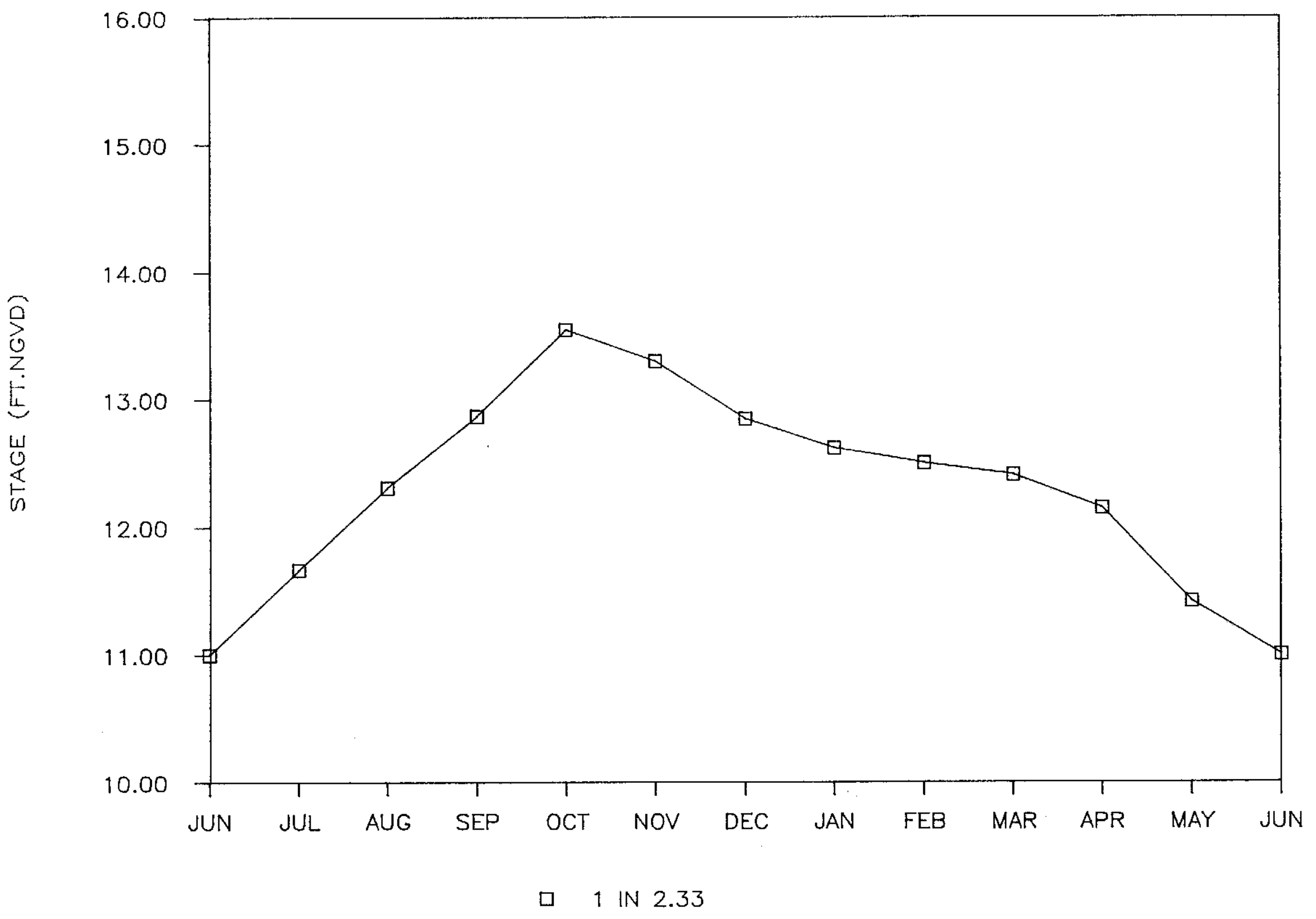


Figure 22 LAKE OKEECHOBEE HISTORICAL STAGES



6. Convert required storage to required stage using storage stage curve.

Figure 23 LAKE OKEECHOBEE OPERATIONAL LIMITS



METHODOLOGY TO DETERMINE LAKE OKEECHOBEE OPERATIONAL LIMITS

7. **Estimate monthly Lake Okeechobee change in storage under one in five years frequency rainfall conditions.**

$$\Delta S = RF + INFLOWS - ET - SEEPAGE$$

Figure 24 UPPER KISS.–KISS.–FEC

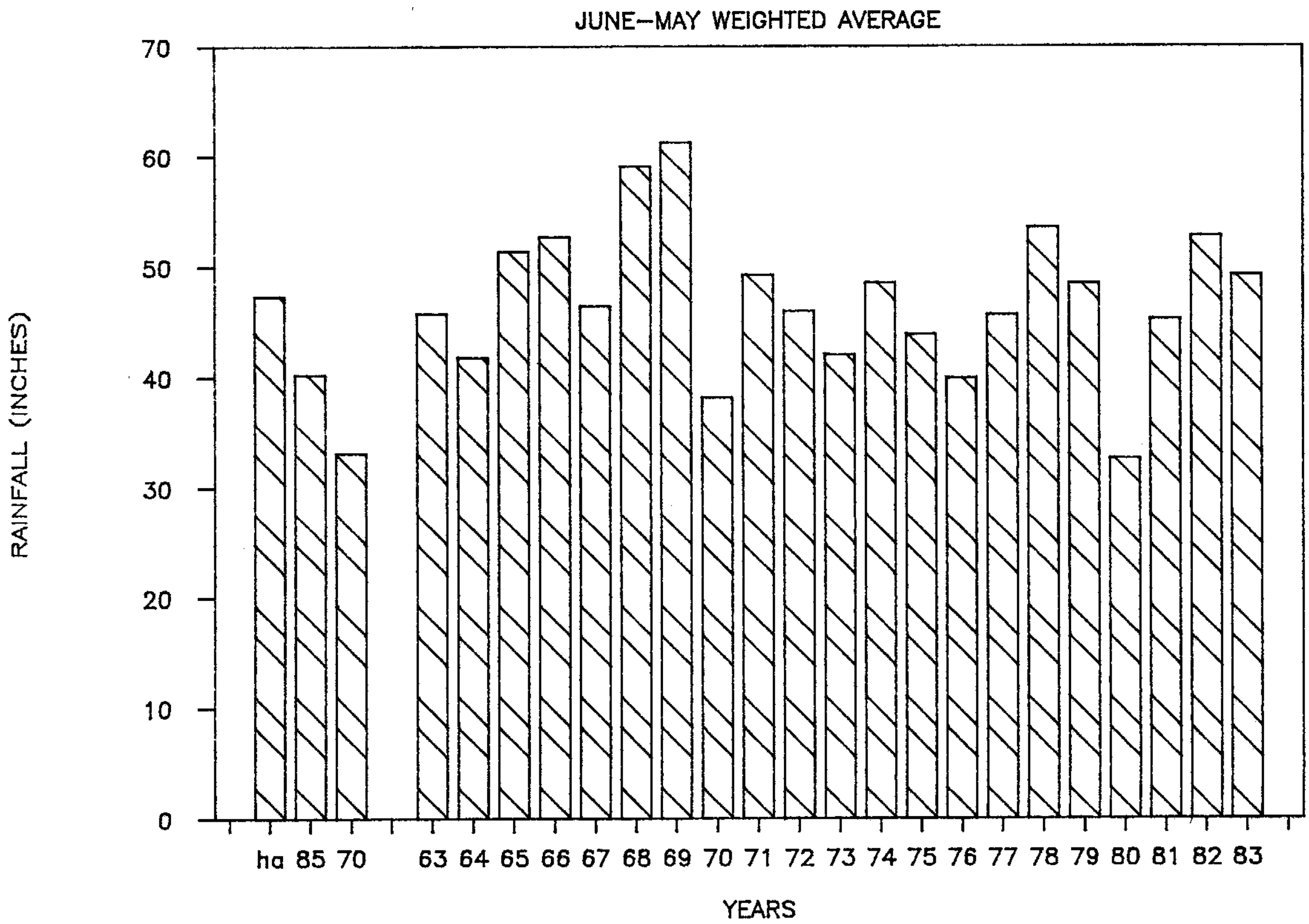


Figure 25 LAKE OKEECHOBEE—WCA1—WCA2—WCA3—EAA

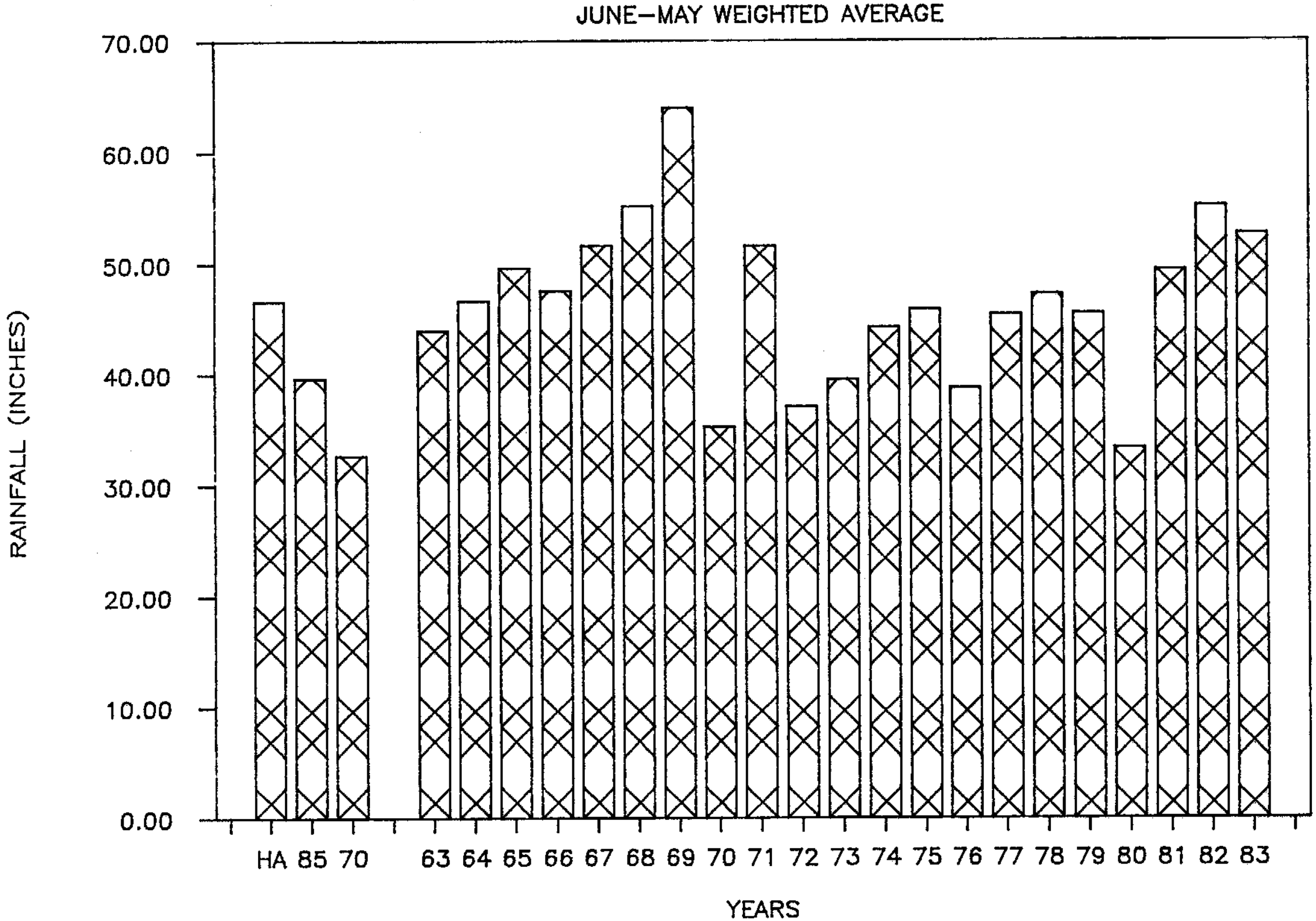
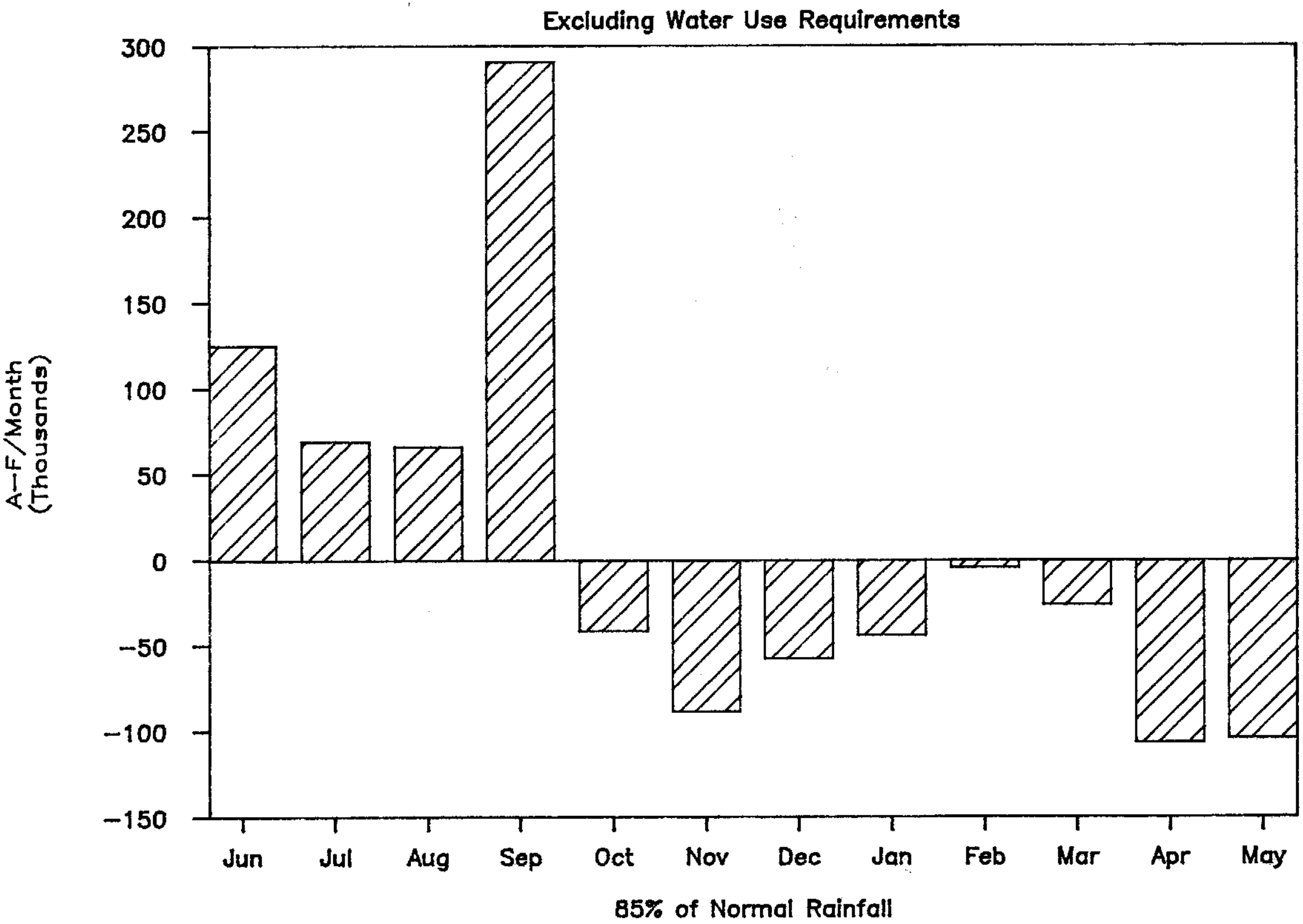


FIGURE 26. Lake Okeechobee Change in Storage

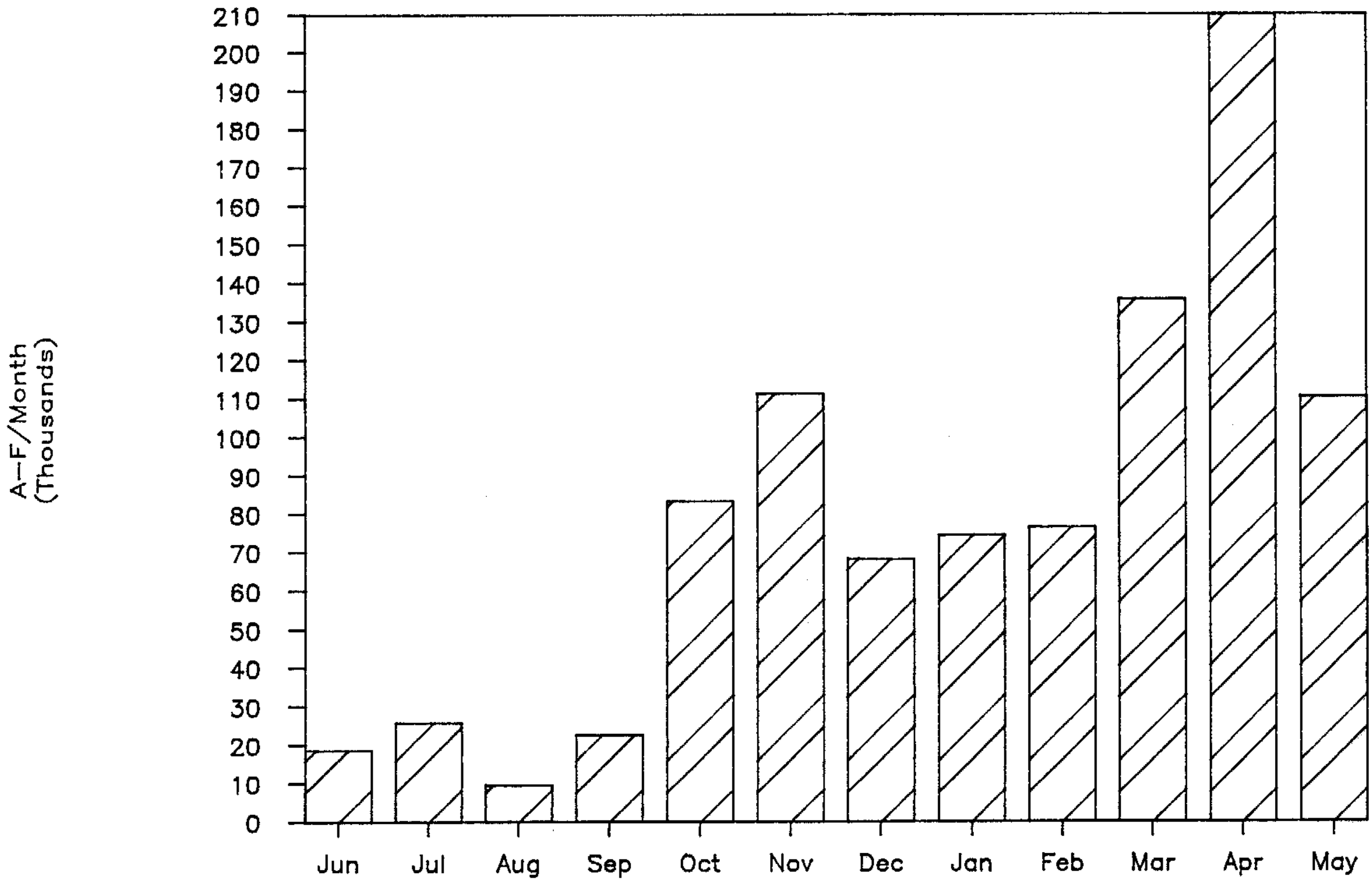


METHODOLOGY TO DETERMINE LAKE OKEECHOBEE OPERATIONAL LIMITS

8. Estimate monthly demands in Lake Okeechobee under one in five years frequency rainfall conditions.

FIGURE 27. Lake Okeechobee Demands

with 85% of Normal Rainfall

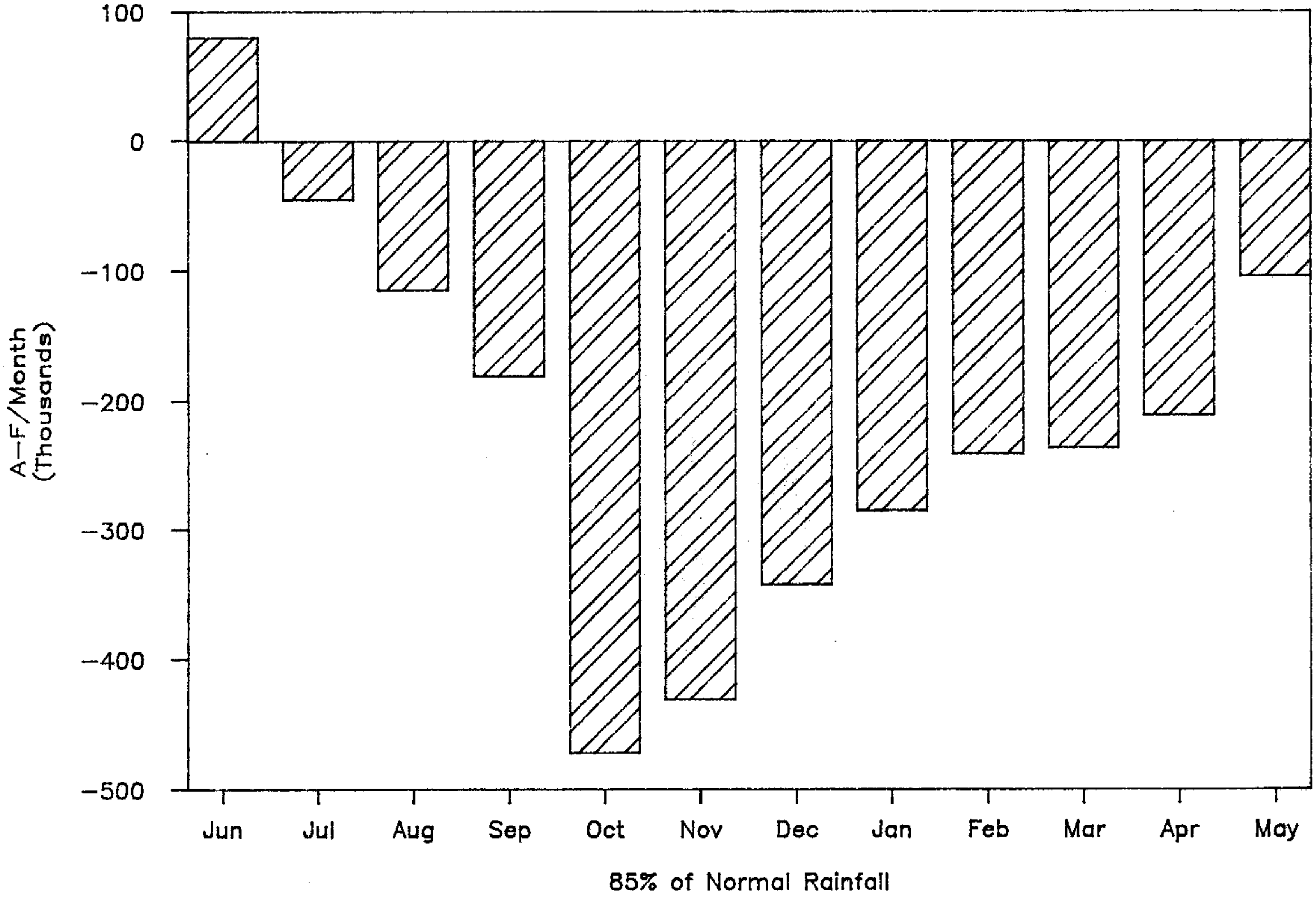


METHODOLOGY TO DETERMINE LAKE OKEECHOBEE OPERATIONAL LIMITS

9. Backsum changes in storage in Lake Okeechobee as estimated in 7 from end of dry season (May 31) to desired month. ($T\Delta S_I$)

FIGURE 28. Lake Okeechobee Change in Storage (Backsummed)

Excluding Water Use Requirements

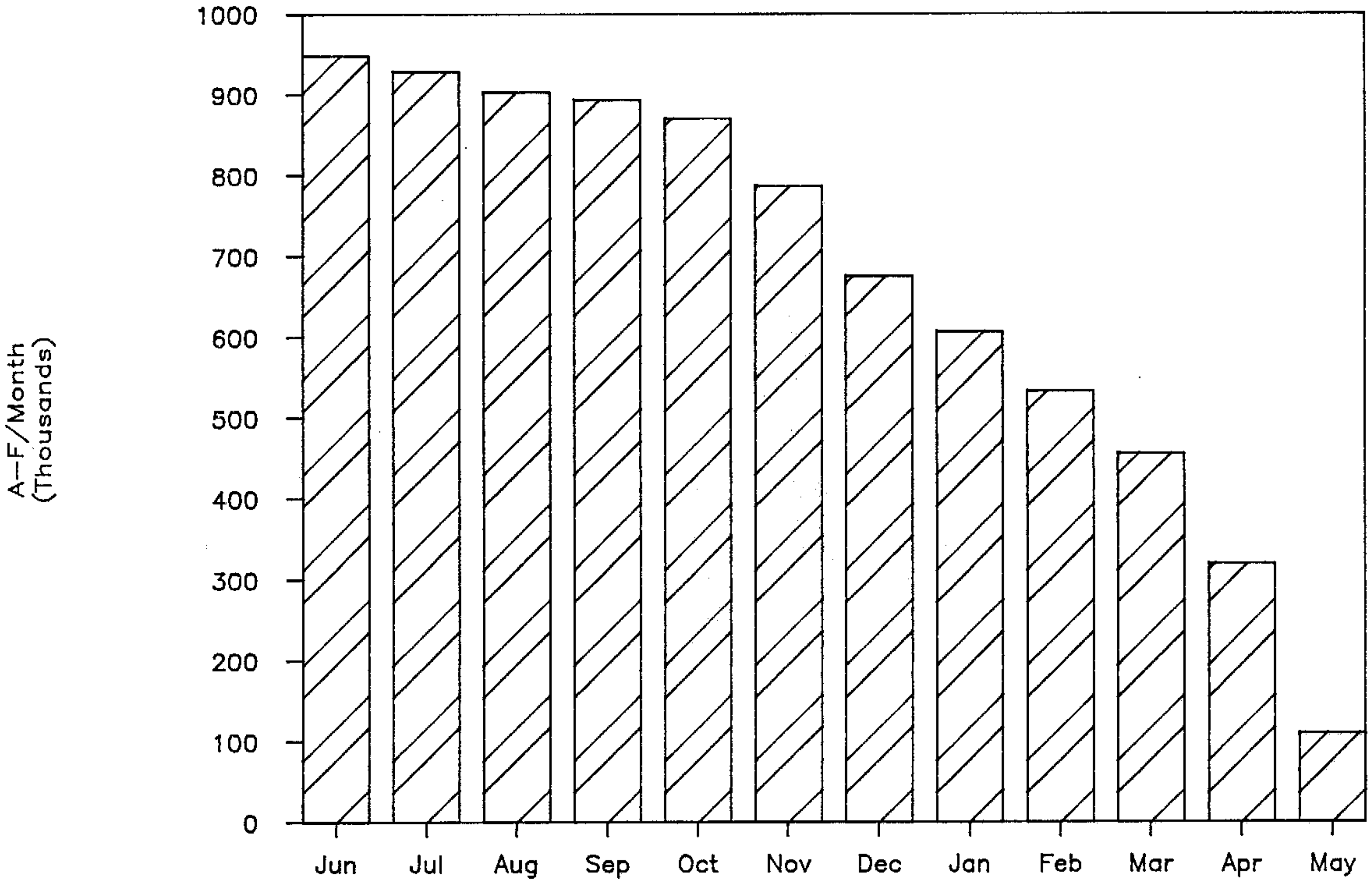


METHODOLOGY TO DETERMINE LAKE OKEECHOBEE OPERATIONAL LIMITS

10. Backsum demands as estimated in 8 from end of dry season to desired month (TD_I)

FIGURE 29. Lake Okeechobee Demands (Backsummed)

with 85% of Normal Rainfall



METHODOLOGY TO DETERMINE LAKE OKEECHOBEE OPERATIONAL LIMITS

11. Determine required storage in Lake Okeechobee at the beginning of each month to meet demands under one in five years frequency rainfall conditions and to end of the dry season (May 31) at stage of 11.0'.

FIGURE 30. Lake Okeechobee Required Storage

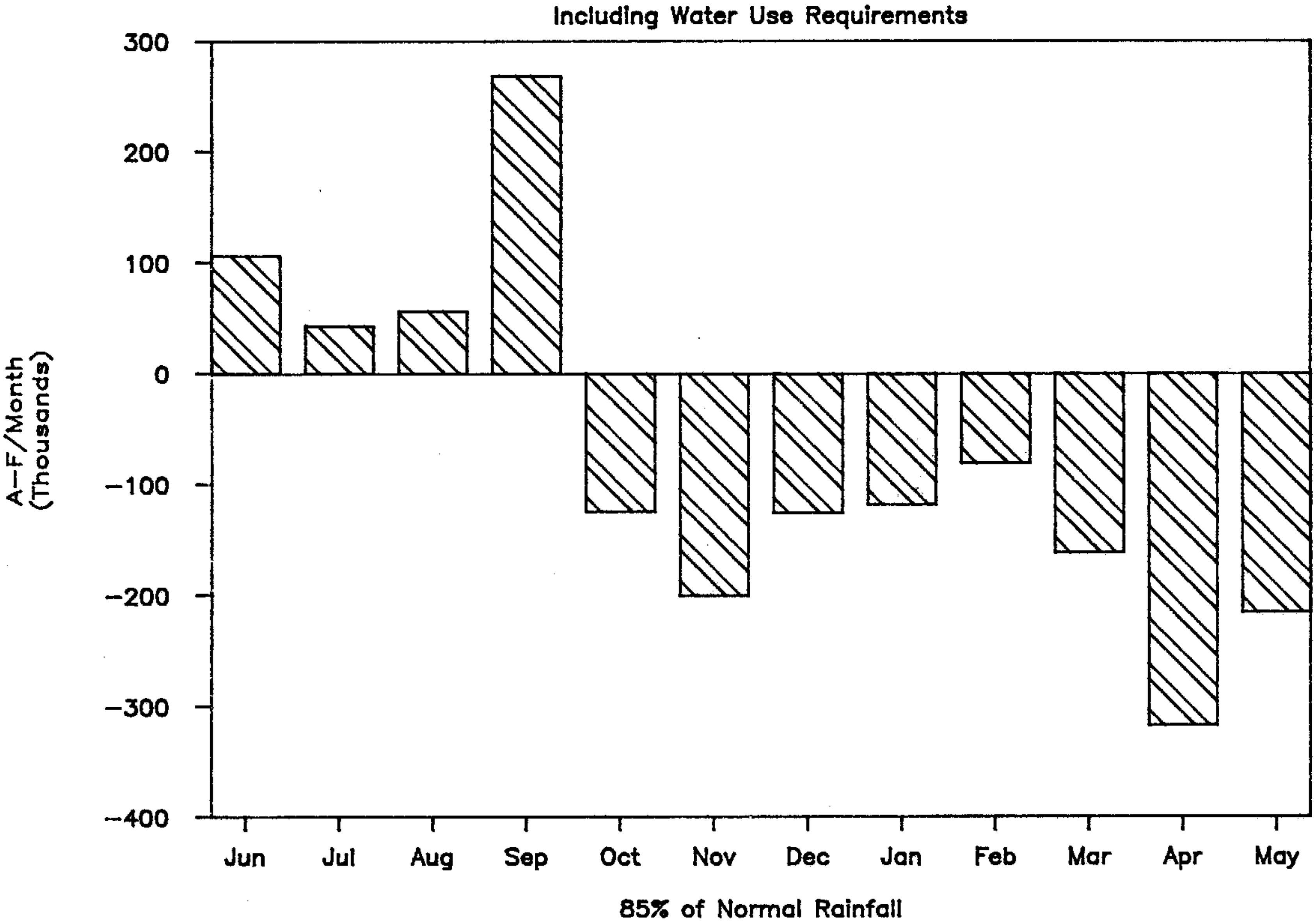
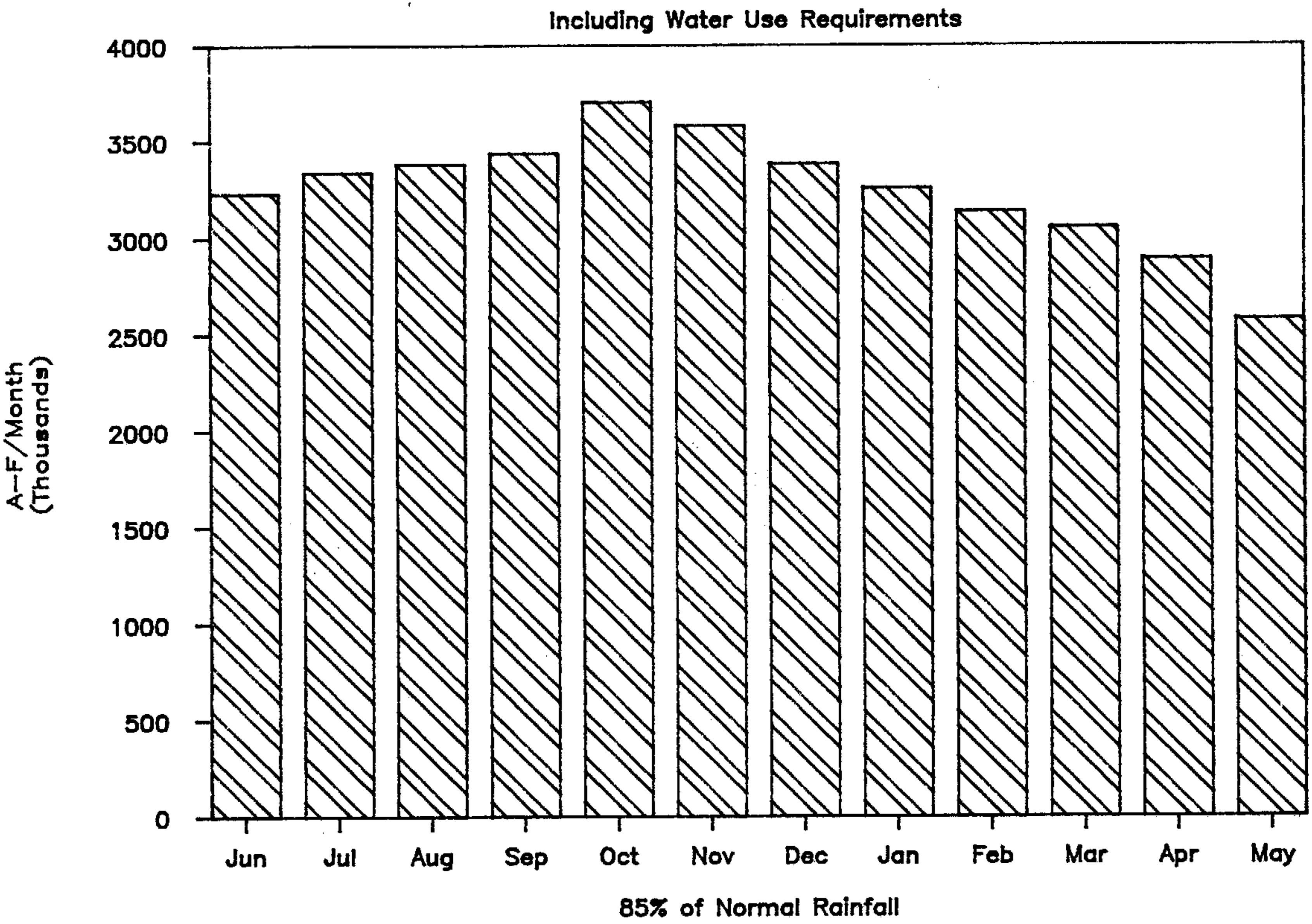


FIGURE 31. Lake Okeechobee Required Storage (Backsummed)



METHODOLOGY TO DETERMINE LAKE OKEECHOBEE OPERATIONAL LIMITS

12. Convert required storage to required stage using storage stage curve.

FIGURE 32. LAKE OKEECHOBEE OPERATIONAL LIMITS

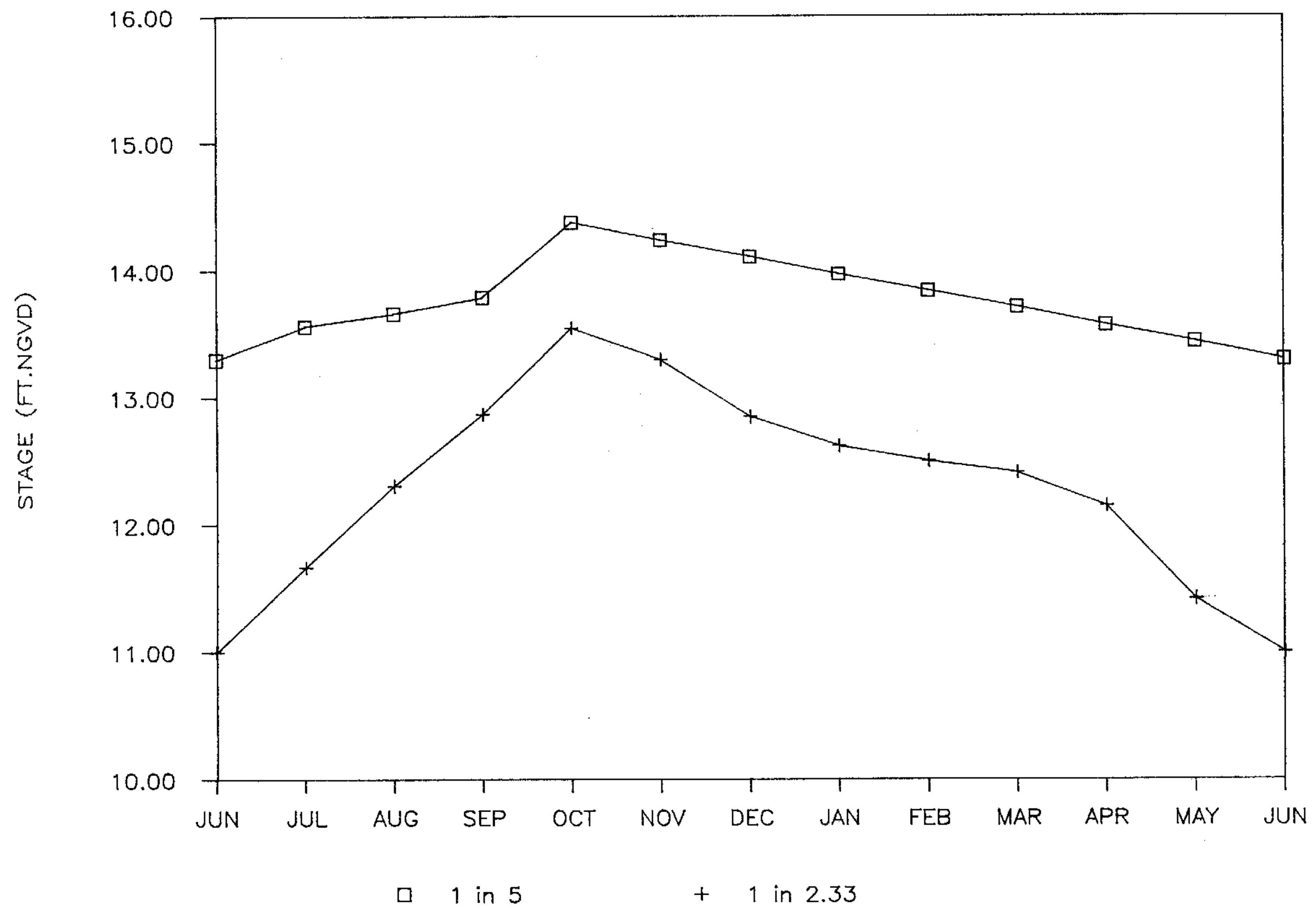
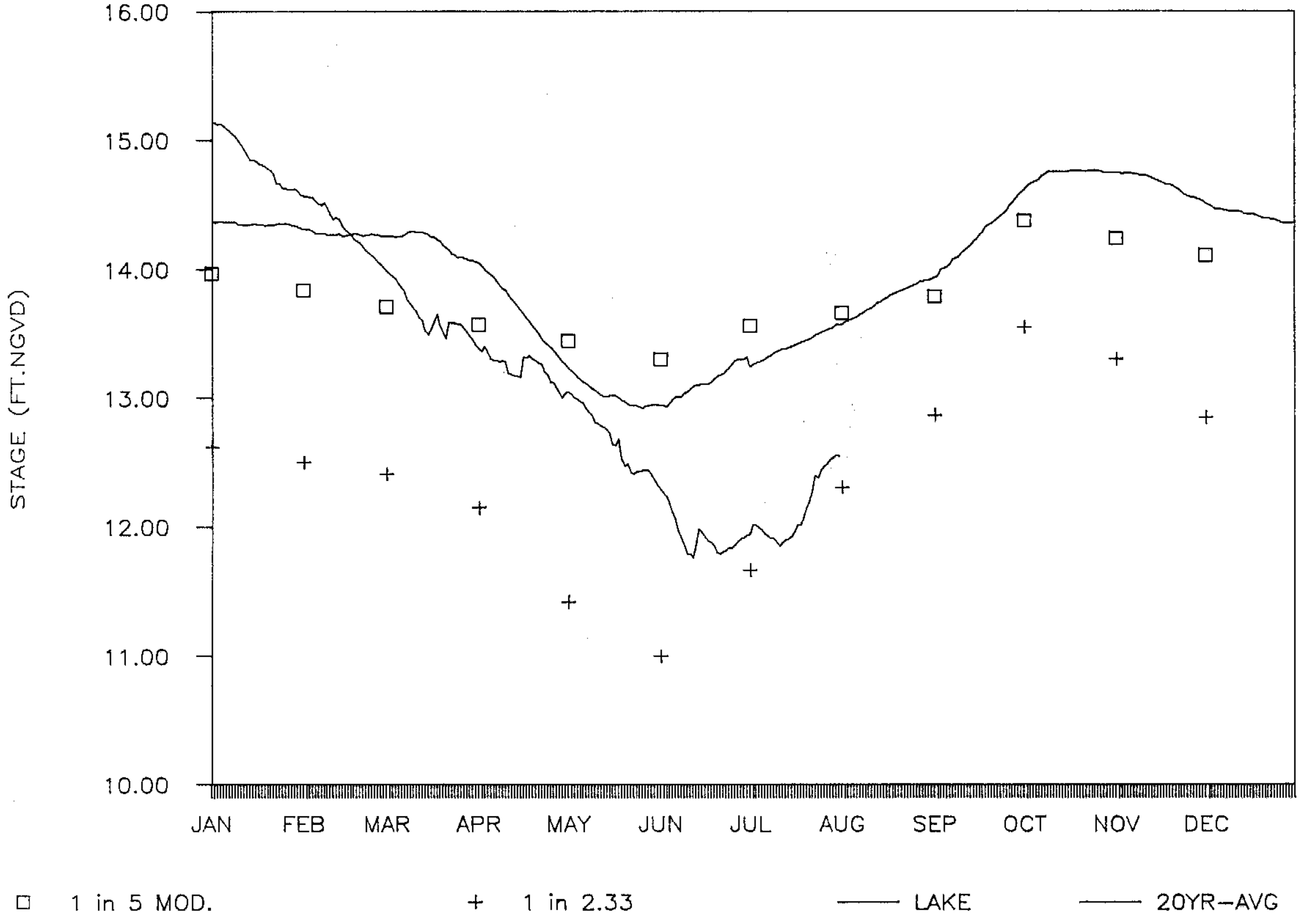


FIGURE 33. LAKE OKEECHOBEE OPERATIONAL LIMITS



V. DEVELOPMENT OF DECISION CRITERIA

A. Options for Increasing/Conserving Lake Storage

In addition to backpumping to increase lake storage, the District has considered the alternative of trying to conserve the storage in Lake Okeechobee by reducing demands on the lake. Three options for pursuing this method are:

1) Voluntary water management practices involving cooperation between the District and the farmers to maximize storage of rain which does fall in the agricultural areas and the subsequent use of this water for irrigation.
2) Formal implementation of the District's Water Shortage Rule with specific restrictions on users.
3) Actions by the District to limit access of users to supplementary water by controlling releases from the lake (Supply-Side Management).

The cooperative water management practices use the internal storage capabilities within the agricultural areas to act as a surge tank to retain rainfall when it does occur and to use this water to supplement supplies during periods of rainfall deficit. The capabilities of using this method are best during the wet season because much of the land is already fallow and seasonally flooded. The District has solicited the cooperation of the agricultural interests in implementing this option and intends to pursue it vigorously for the remainder of the wet season.

The formal implementation of the District's water shortage plan would require a declaration of water shortage. The District, in its rules, has recognized the close tie between plant water use (evapotranspiration), yield, and revenues. For these reasons, in the less severe water shortage phases (moderate and severe), the thrust of the restrictions on agriculture is on voluntary conservation techniques to improve the efficiency of irrigation systems. Only in the two more severe phases (extreme and critical) are withdrawals limited on a quantity basis because they would almost certainly result in significant crop and economic losses. Irrigation systems in the Everglades Agricultural Area, the principal demand area serviced directly by the lake, are particularly efficient because the area is solid agriculture, surrounded by storage areas, and does not leak water to tidewater or other aquifers. The management practices discussed above are considered to be the best available means of improving the interactions between this area with the regional system. The District's thrust in backpumping to Lake Okeechobee is to avoid having to declare a water shortage with the attendant expectation of economic losses. The District believes that the appropriate policy is to emphasize supply augmenting actions during the wet season, and switch the focus to demand management once the dry season arrives and if there are indications that the need for this continues.

Supply-side management represents both a means of limiting water use by limiting access and a method of accounting for water use during a drought period. By scheduling and limiting its releases of water from the lake the District can conserve on supplies. This process, like the water shortage restrictions, puts crop yields and revenues at risk because even normal wet seasons are frequently punctuated by dry spells and the restrictions on lake deliveries during the periods could cause great harm to existing crops. Under the District's supply-side management policy, deliveries are limited to some percentage of historical average. Since during the wet season average deliveries are small, a supply-side management policy would be a no-supply policy.

B. Effectiveness of the SFWMD'S Lake Okeechobee Water Quality Management Plan. Year One: October 1983 - September 1984

1. Lake Okeechobee is a eutrophic lake that is impacted by agricultural runoff (Davis and Marshall 1975; Dickson et al. 1978). To support its management of Lake Okeechobee, the South Florida Water Management District has been monitoring the water quality of the lake and its inflows and outflows since 1973. The first seven years of study were summarized in SFWMD Technical Publication No. 81-2 (Federico et al. 1981). This report demonstrated that the lake receives excessive levels of phosphorus and nitrogen, and concluded that the continuation of excessive nutrient inputs would risk the ecological integrity of the lake, potentially resulting in massive algal blooms, reduced fishery value, and the loss of recreational benefits. To preserve the water quality of the lake, the report recommended that phosphorus and nitrogen inputs be reduced by 40 and 34 percent, respectively. Both phosphorus and nitrogen reductions were recommended because nitrogen/phosphorus ratios indicate that lake phytoplankton growth can be potentially limited by either phosphorus or nitrogen depending on the time of year and other factors (Federico et al. 1981; Brezonik et al. 1979). Based on that recommendation, nutrient loading allocations were assigned to each lake sub-basin according to drainage area, as outlined in the District's water quality management strategy for Lake Okeechobee (SFWMD 1982).

The purpose of this section of the report is to evaluate the effectiveness of the District's Lake Okeechobee Water Quality Management Plan in reducing tributary nutrient loads to the target levels. This report covers the first year (October 1, 1983 to Septem-ber 30, 1984) the Water Quality Management Plan was implemented. Active nutrient control options have been implemented in the S-2 and S-3 basins using the Interim Action Plan and in the S-191 basin by constructing Best Management Practices (BMP's) (Table 1). Water quality management strategies in

Structure	Management Strategy
S-2	Interim Action Plan (July 1979)
S-3	Interim Action Plan (July 1979)
S-4	Regulatory Control of New Drainage Systems
S-191	Best Management Practices (1981)
S-65E	Regulatory Control of New Drainage Systems Pending Results of Kissimmee River Survey Review
S-84	Regulatory Control of New Drainage Systems
S-71	Regulatory Control of New Drainage Systems
S-72	Regulatory Control of New Drainage Systems
S-127	Regulatory Control of New Drainage Systems
S-129	Regulatory Control of New Drainage Systems
S-131	Regulatory Control of New Drainage Systems
S-133	Regulatory Control of New Drainage Systems
S-135	Regulatory Control of New Drainage Systems

TABLE 1. SUMMARY OF WATER QUALITY MANAGEMENT STRATEGY FOR LAKE OKEECHOBEE INFLOW STRUCTURES

the lower priority basins during this first year included only regulatory control of new drainage systems which are designed to improve the quality of water being delivered off site. Regulatory control is a passive strategy which only is effective when there are significant changes in land use. There has been no retrofitting of existing drainage systems for the purpose of improving water quality and changes in land use is a slow process over which occurs many years. Therefore in these low priority basins no significant reduction in nutrient loads resulting from regulatory control would be anticipated during the first year.

2. Materials and Methods

a. Taylor Creek/Nubbin Slough

Water quality data from 26 stations sampled in the Taylor Creek/Nubbin Slough Basin are summarized in a separate report (Appendix B -Taylor

Creek/Nubbin Slough Rural Clean Water Project No. 14, Annual Report, November 1984).

b. Lake Okeechobee

Eight stations are monitored in the limnetic zone of Lake Okeechobee along with 17 inflow/outflow structures around the lake and Fisheating Creek on at least a monthly frequency (Figure 34).

c. Pesticide Monitoring

The District monitors pesticides and herbicides at six pump stations (S-2, S-3, S-4, S-6, S-7, and S-8) discharging from the Everglades Agricultural Area (EAA).

The sampling stations included in this report are shown in Figure 34. The frequency of monitoring and the parameters measured are given in Table 2. Water quality in the lake was measured monthly. Sampling of inflows and outflows around the lake was conducted every two to four weeks, depending on discharge. In a few cases, data were not collected for a longer period of time if there had not been any discharge. Sampling and analytical procedures have been described in SFWMD Technical Publication 81-2.

Pesticides were sampled from the water and sediment at S-2, S-3, S-4, S-6, S-7, and S-8 on August 29, 1984. Water column samples were taken with a van Dorn sampler and placed in sulfuric acid-preserved, teflon cap-lined, glass Mason jars supplied by the contract lab (Technical Services, Inc. of Jacksonville, Certification No. 82145). These samples were analyzed for herbicides. Surface sediment samples were collected using an Ekman dredge and also put in one quart, teflon cap-lined, glass Mason jars. All samples were then placed on ice and shipped to the lab. Herbicides were analyzed by Standard Methods, 15th Edition, Method 509B.

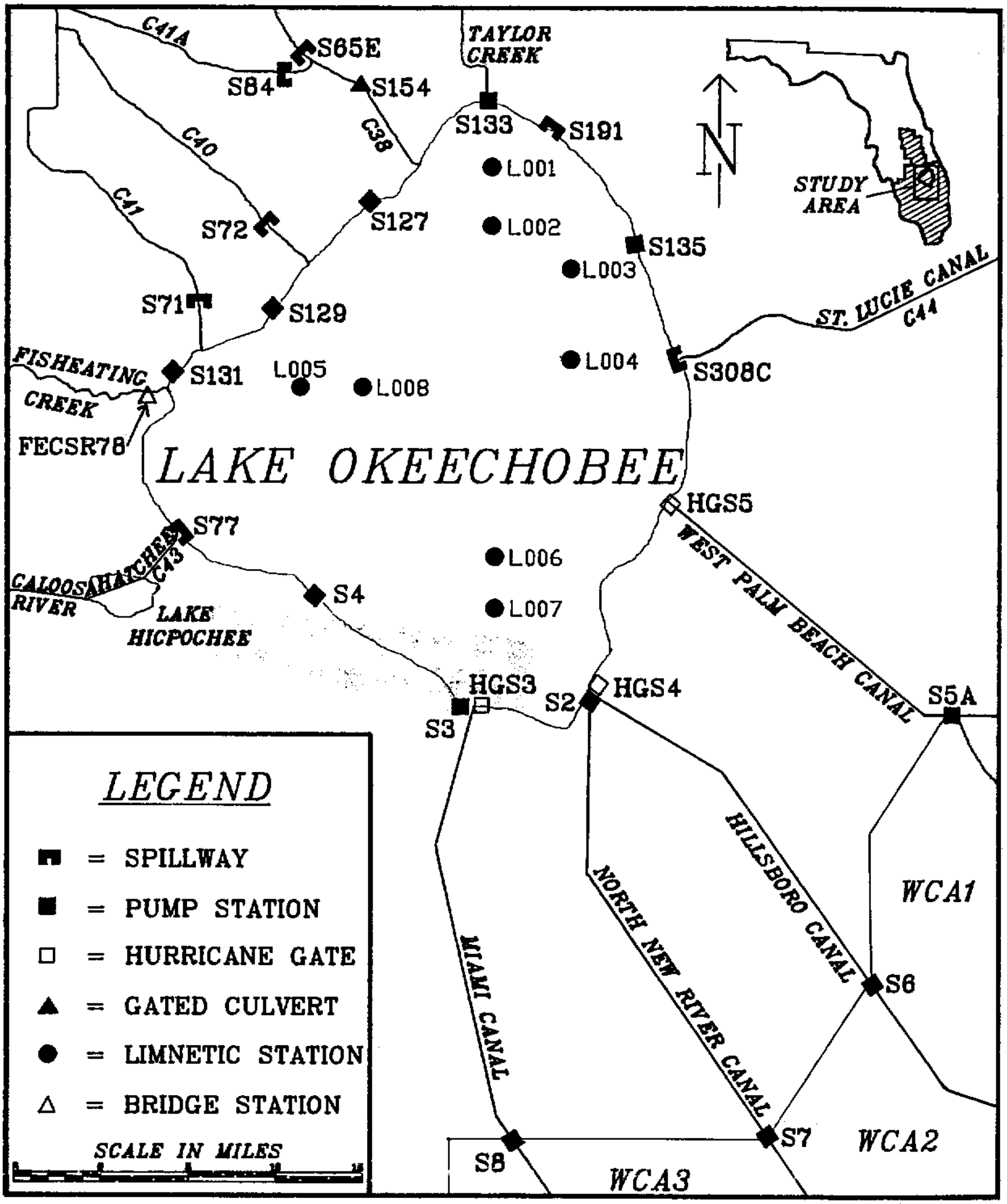


Figure 34. Lake Okeechobee Water Quality Management Plan Sampling Stations.

TABLE 2. WATER QUALITY PARAMETERS

Sampling Frequency	Parameter
Monthly	Temperature
Monthly	Dissolved Oxygen
Monthly	Specific Conductance
Monthly	pH
Monthly	Turbidity
Monthly	Color
Monthly	Nitrite
Monthly	Nitrate
Monthly	Ammonia
Monthly	Total Nitrogen
Monthly	Total Kjeldahl Nitrogen
Monthly	Ortho Phosphorus
Monthly	Total Phosphorus
Monthly	Total Suspended Solids
Monthly	Alkalinity
Monthly	Chloride
Quarterly	Total Iron

The other pesticides were analyzed by EPA Method 608.

Measured nutrient loading rates for the major lake inflows are compared to target loading rates later in this report. Target loads deal only with portions of the lake basin identified as "controllable sources" by the District's Lake Okeechobee Water Quality Management Plan. Consequently, inputs from the Upper Kissimmee Basin and the Lake Istokpoga Basin are not included in the target loads for S-65E,S-71, S-72, and S-84. In Table 5 (see Results section), the discharge and nutrient loads from the outflow of Lake Kissimmee (S-65) were subtracted from those at S-65E to obtain values for the lower Kissimmee basin. Ideally, the discharge and loads from the Lake Istokpoga outflow (S-68) should have been subtracted from the values at S-71, S-72, and S-84, but discharge data from S-68 was unavailable. However, since S-68 was closed throughout most of the year, any discharge from this structure was assumed to be minor.

3. Results

a. Water Quality Data Summary

Table 3 summarizes the water quality at each lake station and the lake average for the year. There are no substantial differences in water

TABLE 3. LAKE OKEECHOBEE AVERAGE WATER QUALITY DATA (OCTOBER 1983 - SEPTEMBER 1984)

Station	Temp (Celsius)	D.O. (mg/L)	Sp Conduct (micromhos/cm)	pH	Turbidity (NTU)	Color (PTU)	Tot. Sus. Solid (mg/L)	NO_2-N (mg/L)	NO_3-N (mg/L)	NH_4-N (mg/L)	Total N (mg/L)	TKN (mg/L)	Ortho-P (mg/L)	Total P (mg/L)	Total Alk (mg/L $CaCO_3$)	Chloride (mg/L)	Total Fe (mg/L)
L001	23.2	8.6	459	8.12	14.8	53	14.0	0.004	0.060	0.02	1.61	1.55	0.028	0.112	91.2	60.4	0.47
L002	23.1	8.8	540	8.22	22.0	35	18.8	0.004	0.133	0.01	1.54	1.41	0.024	0.096	109.3	69.4	0.48
L003	24.3	9.0	543	8.14	28.1	36	16.0	0.004	0.157	0.02	1.67	1.51	0.036	0.107	107.0	72.0	0.55
L004	24.5	8.7	541	8.09	33.0	33	17.9	0.005	0.163	0.02	1.50	1.34	0.032	0.112	108.9	71.7	0.66
L005	23.7	9.2	510	8.40	14.9	47	8.8	0.004	0.053	0.02	1.94	1.89	0.010	0.081	101.8	66.4	0.39
L006	23.8	8.5	543	8.03	22.8	34	16.8	0.009	0.169	0.02	1.50	1.33	0.034	0.100	110.6	71.3	0.49
L007	24.0	8.9	538	8.11	16.0	36	9.8	0.006	0.167	0.02	1.53	1.36	0.030	0.078	108.3	70.6	0.39
L008	23.8	9.0	526	8.20	28.3	40	17.0	0.006	0.132	0.02	1.77	1.64	0.026	0.103	107.7	69.3	0.52
Lakewide Average	23.8	8.8	525	8.16	22.5	39	14.9	0.005	0.129	0.02	1.63	1.50	0.028	0.099	105.6	68.9	0.49

quality between stations. Most water quality measurements were similar to the base period of 1973-80 with the exception of total phosphorus concentrations which in 1983-84 averaged 0.099 mg P/L as compared to the base period average of 0.063 mg P/L. Mean annual total P concentrations have been higher than the base period in the last five years, four of which were prior to implementation of the Water Quality Management Plan. Mean annual total N has declined since peaking at 2.62 mg/L in 1980-81 (Figure 35). The recent rise in phosphorus follows the increase in the lake's regulated stage to 15.5-17.5 ft MSL in 1978. A correlation between ortho phosphorus and lake stage was established in SFWMD Tech. Pub. 81-2. Recent work (SFWMD draft report) has shown a high correlation between phosphorus and maximum winter time lake stage and that the addition of a lake stage factor to a phosphorus input-output model may significantly improve the prediction of limnetic total P concentrations in Lake Okeechobee. This and other evidence indicates that internal loading processes are important in regulatory lake phosphorus concentrations and in maintaining the lake's trophic state. The influence of lake stage, littoral zone nutrient transport, and wind-induced sediment resuspension are being investigated further.

Lake inflow and outflow water quality is shown in Table 4. Quality data for S-6, S-7, and S-8 are also given in this table.

b. <u>Discharges and Nutrient Loads</u>

Table 5 shows discharges from lake and WCA inflows for the 1983-84 year in comparison to mean annual discharges during the period 1973-1980. Discharge from all lake inflows together was 72 percent of the average inflow of 1973-80, but individually, 8 of the 14 inflows had above average discharges. Some stations (S-4, S-127, and S-133) pumped more than twice their 1973-80 mean flows. S-2 and S-3 inflows were far below their 1973-80 averages due to the limitation on pumping from these structures

GURE 35. MEAN ANNUAL LAKE OKEECHOBEE TOTAL N AND TOTAL P CONCENTRATIONS

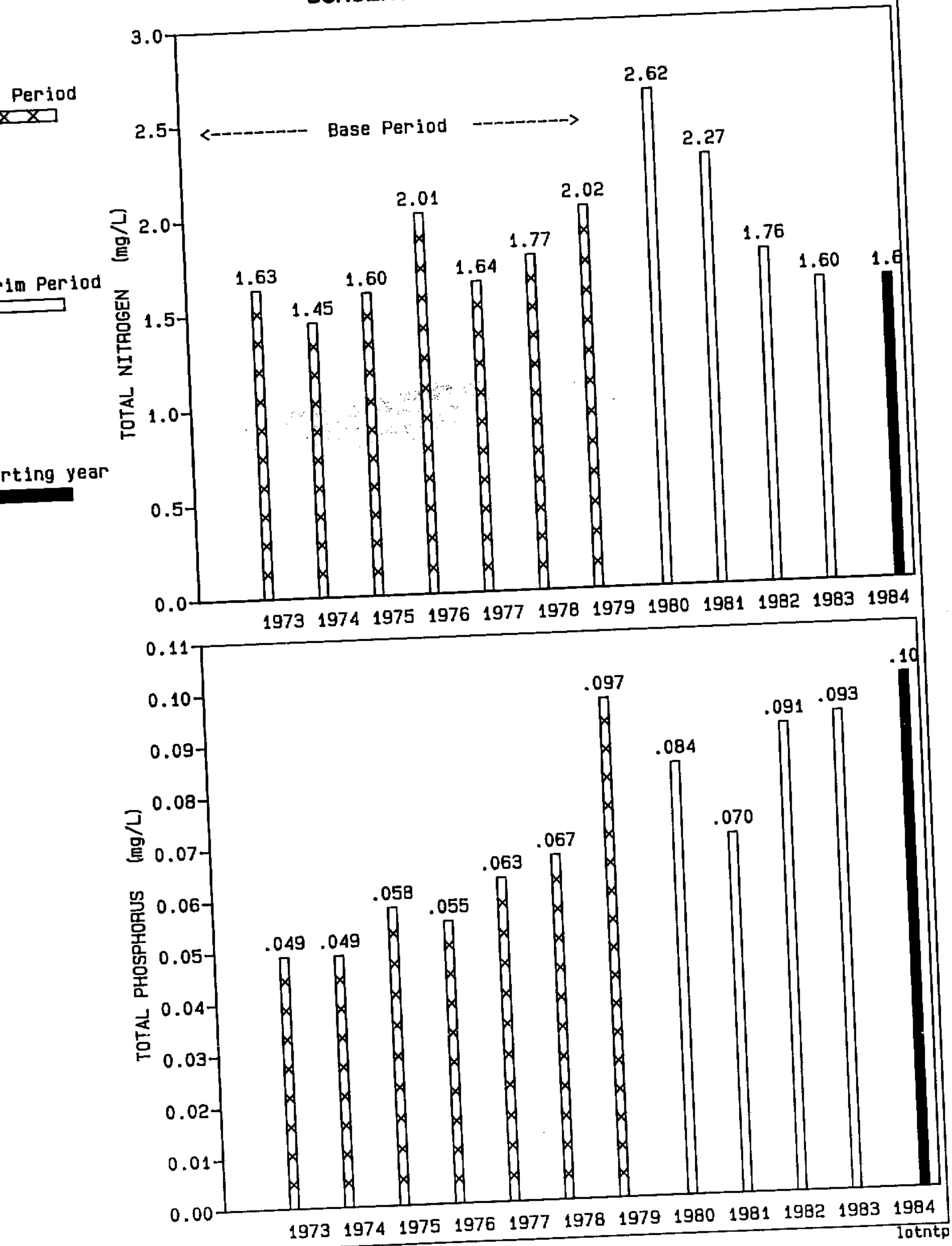


TABLE 4. AVERAGE WATER QUALITY DATA FOR LAKE OKEECHOBEE AND WATER CONSERVATION AREA INFLOWS AND OUTFLOWS (OCTOBER 1983 - SEPTEMBER 1984)

Station	Temperature (Celsius)	Dissolved Oxygen (mg/L)	Specific Conductance (micromhos/cm)	pH	Turbidity (NTU)	Color (PTU)	Total Suspended Solids (mg/L)
Lake Inflows							
S-2	27.6	5.9	568	7.10	18.7	122	34.0
S-3	27.3	4.7	957	7.37	30.1	125	67.6
S-4	25.4	3.6	714	7.08	5.7	120	10.0
S-127	24.0	5.8	1067	7.35	3.2	163	4.9
S-129	23.0	5.8	689	7.29	2.5	120	5.1
S-131	23.1	6.3	779	7.58	2.5	95	6.5
S-133	23.7	6.8	649	7.44	4.1	115	6.0
S-135	23.4	7.4	858	7.80	4.3	74	7.0
S-154	24.3	3.2	392	6.54	6.0	253	13.7
S-71	25.2	4.6	242	6.16	3.2	177	2.4
S-72	25.6	4.8	291	6.24	4.0	235	3.6
S-84	26.3	6.8	158	6.53	3.2	107	5.3
S-65E	23.7	6.5	158	6.67	3.5	93	6.5
S-191	23.5	4.5	411	6.64	5.2	234	6.5
Fisheating Cr.	27.0	4.1	111	5.73	1.9	285	3.2
Lake Outflows							
HGS-3	21.9	7.4	675	7.94	10.0	40	13.3
HGS-4	22.4	6.8	605	7.62	14.1	35	12.0
HGS-5	23.7	6.9	577	7.66	33.2	41	32.3
S-77	24.9	4.1	523	7.15	4.2	70	6.9
S-308C	24.4	8.5	537	8.16	37.1	39	
WCA Inflows							
S-6	25.9	2.9	1429	7.09	16.9	173	74.0
S-7	21.4	5.5	961	7.44	8.9	135	15.0
S-8	21.4	5.1	627	7.41	28	120	28.5

TABLE 4. (continued)

Station	NO_2-N (mg/L)	NO_3-N (mg/L)	NH_4-N (mg/L)	Total N (mg/L)	TKN (mg/L)	Ortho-P (mg/L)	Total P (mg/L)	Total Alkalinity (mg/L $CaCO_3$)	Chloride (mg/L)	Total Iron (mg/L)
Lake Inflows										
S-2	0.041	1.366	0.28	4.70	3.29	0.087	0.228	266.1	140.6	
S-3	0.083	1.035	0.61	4.54	3.42	0.018	0.192	226.8	126.5	
S-4	0.040	0.249	0.54	2.61	2.32	0.272	0.452		76.3	0.48
S-127	0.018	0.080	0.09	2.21	2.13	0.207	0.320	155.4	178.6	0.30
S-129	0.008	0.033	0.04	1.53	1.51	0.052	0.106	147.1	80.8	0.30
S-131	0.017	0.030	0.09	1.51	1.47	0.029	0.077	156.1	105.5	0.20
S-133	0.029	0.360	0.13	2.07	1.68	0.234	0.348	126.5	85.8	0.32
S-135	0.014	0.087	0.04	1.72	1.62	0.031	0.087	191.7	122.2	0.19
S-154	0.013	0.019	0.09	1.70	1.67	0.503	0.906	39.9	81.1	0.99
S-71	0.027	0.585	0.09	1.90	1.29	0.089	0.176	17.1	22.0	0.54
S-72	0.018	0.084	0.10	1.58	1.48	0.078	0.197	28.3	26.9	0.63
S-84	0.008	0.072	0.31	1.12	1.04	0.021	0.079	8.8	16.4	0.54
S-65E	0.008	0.057	0.08	1.33	1.30	0.057	0.124	25.4	19.6	0.39
S-191	0.044	0.470	0.20	2.16	1.64	0.715	0.922	49.3	63.7	0.47
Fisheating Creek	0.015	0.004	0.05	1.21	1.20	0.135	0.272	7.5	16.8	0.75
Lake Outflows										
HGS-3	0.010	0.086	0.04	1.94	1.76	0.006	0.068	108.4	85.7	
HGS-4	0.007	0.113	0.05	1.43	1.38	0.027	0.093	113.5	69.9	
HGS-5	0.007	0.187	0.19	1.90	1.70	0.046	0.238	122.5	69.1	
S-77	0.017	0.143	0.09	1.63	1.47	0.042	0.098	108.1	65.5	0.25
S-308C	0.005	0.166	0.03	1.87	1.71	0.033		108.1	69.1	2.02
WCA Inflows										
S-6	0.097	0.703	0.12	4.51	3.82	0.010	0.098	320.9	213.9	0.19
S-7	0.008	1.457	0.03	4.12	2.67	0.053	0.096	334.6	158.2	0.24
S-8	0.120	1.002	0.03	3.88	2.87	0.058	0.199	238.9	83.1	0.52

TABLE 5. DISCHARGES AND NUTRIENT LOAD COMPARISONS (OCTOBER 1983 - SEPTEMBER 1984)

Structure Basin	Discharge (acre-feet)		Total P Load (tons/yr)			Total N Load (tons/yr)		
	Average 1973-80	1983-84	Average 1973-80	Target	1983-84	Average 1973-80	Target	1983-84
S-2	195,880	51,047	35	18	18.6	1,548	156	485.6
S-3	55,733	23,171	7	7	11.8	373	95	255.3
S-4	34,887	74,580	15	15	58.1	142	142	275.4
S-127	10,886	33,685	7	7	15.3	34	34	100.5
S-129	11,168	14,682	3	3	2.3	33	33	30.8
S-131	5,277	5,607	1	1	0.6	13	13	12.2
S-133	15,680	50,384	7	7	26.7	41	41	144.8
S-135	17,432	32,947	4	4	3.9	51	51	74.5
S-71	169,838	157,922	47	47	40.9	323	323	393.4
S-72	37,425	15,598	8	11	4.4	86	132	39.9
S-84	140,630	143,601	6	13	14.9	110	258	272.6
S-65E	589,326	244,275	108	86	111.5	997	838	295.1
S-191	153,586	108,073	189	98 (139)	146.2	479	258 (388)	283.6
Fisheating Creek	203,449	230,128	65	65	82.9	575	575	432.0
TOTAL	1,641,197	1,185,700	502	382	538.1	4,805	2,949	3,095.7
WCA Inflows								
S-6		161,437						
S-7		326,829						
S-8		492,227						

NOTES:
Discharges and calculated nutrient loads for S-71, S-72, and S-84 possibly include small inputs from Lake Istokpoga through S-68. Discharges and nutrient loads from S-65E do not include inputs from the Upper Kissimmee Basin through S-65.

Three year target loads for S-191 are shown in parentheses.

as determined by the District's Interim Action Plan. Flows from S-191 and S-65E were also below average.

The District's Water Quality Management plan sets target nutrient loads to the lake from the District's water control structures and the Fisheating Creek basin which are not to exceed 382 tons total P and 2949 tons total N per year. These target loads are 24 percent below the average total P load (502 tons/yr) and 39 percent below the average total N load (4805 tons/yr) for the 1973-80 base period. Specific target loads for each inflow have also been established (Table 5). To ensure that nutrient reductions are uniformly achieved, the target loads for each inflow cannot be exceeded by more than 10 percent.

Further limitations on loads from basins deemed critical to the District's nutrient control strategy have also been established. S-2 and S-3 are required to achieve their target loads in three years instead of five. S-191 is restricted to a 3-year target loads of 139 tons P and 388 tons N and concentrations of 0.67 mg P/L and 1.72 mg N/L.

Table 5 shows that the 1983-84 total P loading to the lake was similar to the base 1973-80 level, but 41 percent above the target level. Total N loading was substantially lower and almost met the target nitrogen load for the lake. The lower nitrogen load was due primarily to reduced inputs from S-2 and S-65E.

Nitrogen inputs from S-2 and S-3 remained above the target loads, although well below their average annual loads for the 1973-80 base period. Although S-2 was within 10 percent of its loading limit for phosphorus, the average total P concentration at this station has doubled when compared to the base period of 1973-80. Likewise, average flow weighted total P concentrations have doubled at S-4 and quadrupled at

S-3 (Table 6). A change in sampling methodologies in 1981 from grab sampling to flow-proportional automatic sampling may partially contribute to the apparent increase in nutrient concentrations. In addition, the pumpage at S-4 was substantially greater in 1983-84 than in the base period. The combination of high P concentration and higher flows results in a very large increase in P loading at S-4. Nitrogen concentrations were also higher at S-2 and S-3. These higher concentrations have reduced the effectiveness of the District's Interim Action Plan.

TABLE 6. COMPARISON OF FLOW-WEIGHTED CONCENTRATIONS

Structure Basin	Total P (mg/L)		Total N (mg/L)	
	1973-80	1983-84	1973-80	1983-84
S-2	0.132	0.268	5.82	7.00
S-3	0.095	0.374	4.92	8.10
S-4	0.314	0.573	2.56	2.72
S-127	0.484	0.334	2.31	2.19
S-129	0.189	0.115	2.17	1.54
S-131	0.138	0.079	1.87	1.60
S-133	0.341	0.390	1.90	2.11
S-135	0.181	0.087	2.14	1.66
S-71	0.260	0.190	2.26	1.83
S-72	0.217	0.207	2.59	1.88
S-84	0.066	0.076	1.35	1.40
S-65E	0.163	0.336	1.51	1.89
S-191	0.906	0.995	2.29	1.93
Fisheating Creek	0.235	0.265	2.08	1.38

S-191 phosphorus loading was above the 5-year target load, but within 10 percent of the 3-year target load. The nitrogen load was within 10 percent of the 5 year target load and well below the 3-year target load. The average flow-weighted nutrient concentrations for the period 1983-84 were 0.995 mg P/L and 1.93 mg N/L. These nutrient levels are similar to the average concentrations for 1973-80 (0.906 mg P/L, and 2.29 mg N/L). Both nutrient concentrations exceed the 3-year target concentrations.

Among the other individual inflows, S-129, S-131, and S-72 met their target loads for both phosphorus and nitrogen. S-135 and S-71 met their target loads for phosphorus. S-84, S-65E, and Fisheating Creek met their target nitrogen loads or exceeded them by less than 10 percent. The achievement of target loading rates was due to discharge volumes rather than management practices in these watersheds.

c. Pesticide Summary

No pesticide residues were found in either the water or sediment samples. Tables 7 and 8 show the minimum detection limits for the pesticides

TABLE 7. RESULTS FOR PESTICIDE WATER SAMPLES COLLECTED ON AUGUST 29, 1984 (ug/L)

Station	2,4-D	2,4,5-T	(Silvex) 2,4,5-TP
S-2	<1.0	<0.5	<0.5
S-3	<1.0	<0.5	<0.5
S-4	<1.0	<0.5	<0.5
S-5	<1.0	<0.5	<0.5
S-6	<1.0	<0.5	<0.5
S-7	<1.0	<0.5	<0.5
S-8	<1.0	<0.5	<0.5

analyzed in the water and sediment samples, respectively. Copies of the lab reports from Technical Services, Inc., are in Appendix A.

TABLE 8. RESULTS FOR PESTICIDE SEDIMENT SAMPLES COLLECTED ON AUGUST 29, 1984 (ug/kg)

Station	Aldicarb	Aldrin	Alpha BHC	Beta BHC	(Lindane) Gamma BHC	Delta BHC	Chlordane	OP-DDD	PP-DDD	OP-DDE	PP-DDE	OP-DDT	PP-DDT
S-2	<1	<.2	<.1	<.4	<.1	<.02	<2	<.8	<.8	<.6	<.4	<2	<2
S-3	<1	<.2	<.1	<.4	<.1	<.02	<2	<.8	<.8	<.6	<.4	<2	<2
S-4	<1	<.2	<.1	<.4	<.1	<.02	<2	<.8	<.8	<.6	<.4	<2	<2
S-6	<1	<.5	<.2	<1	<.3	<.05	<6	<2	<2	<1	<2	<4	<4
S-7	<1	<.5	<.2	<1	<.3	<.05	<6	<2	<2	<1	<2	<4	<4
S-8	<1	<.2	<.1	<.1	<.1	<.02	<2	<.8	<.8	<.6	<4	<2	<2

Station	Diazinon	Dieldrin	Alpha Endosulfan	Beta Endosulfan	Endosulfan Sulfate	Endrin Aldehyde	Ethion	Heptachlor	Heptachlor Epoxide	Kelthane	Malathion
S-2	<2	<.4	<.07	<.7	<2	<1	<3	<.2	<.27	<3	<3
S-3	<2	<.4	<.07	<.7	<2	<1	<3	<.2	<.27	<3	<3
S-4	<2	<.4	<.07	<.7	<2	<1	<3	<.2	<.27	<3	<3
S-6	<6	<1	<.2	<.7	<4	<3	<8	<.5	<.7	<6	<6
S-7	<5	<1	<.2	<.7	<4	<3	<8	<.5	<.7	<6	<6
S-8	<2	<.4	<.07	<.7	<2	<1	<3	<.2	<.27	<3	<3

Station	Methoxy-chlor	Mirex	Parathion (Ethyl Parathion)	PCB	(Tedion) Tretradifon	Toxaphene	Trithion	2,4-D	(Silvex) 2,4,5-TP
S-2	<3	<1	<.8	<7.0	<3	<6	<3	<1	<.2
S-3	<3	<1	<.8	<7.0	<3	<6	<3	<1	<.2
S-4	<3	<1	<.8	<7.0	<3	<6	<3	<1	<.2
S-6	<0	<3	<2	<18	<8	<6	<7	<1	<.2
S-7	<0	<3	<2	<18	<8	<6	<7	<1	<.2
S-8	<3	<1	<.8	<7.0	<3	<5	<3	<1	<.2

4. Water Quality Management Activities

a. As discussed in the RCWP report cited above, BMP implementation in the Taylor Creek/Nubbin Slough watershed is still in progress. Therefore, the water quality at S-191 in 1983-84 does not reflect the benefits that are expected after these BMP's are installed. See Appendix B for RCWP Report.

b. Effective July 1985, the point system for initiating pumping in Lake Okeechobee and the WCA's under the Interim Action Plan has been modified. The "time of day" and "time of week" factors have been eliminated. These were economic factors designed to hold down the District's operating costs. Analysis of 1983-84 data (see Tables 9 and 10) showed that the elimination of these factors from the point system could have reduced flows from S-2 and S-3 by an additional 40 percent.

c. The increase in nutrient concentrations at all EAA pump stations could be caused by either changes in basin drainage practices, changes in agricultural practices, or the effect of the Interim Action Plan in allowing pumping only during intense runoff. Possible reasons for this trend are being investigated further. These investigations will be concentrated in the S-3 and S-4 drainage basins and will include cooperative studies being pursued with the IFAS center in Belle Glade to assess the effects of existing agricultural practices and to assess changes in management practices to improve water quality.

d. The Kissimmee River Resource Planning and Management Committee is preparing recommendations that address water quality management plans and strategy for the Kissimmee River Valley. The District's representation on this committee has assured that the recommendations are consistent with the overall management objectives for Lake Okeechobee. Final action on the committee's recommendations is expected by the end of the summer, and implementation of control programs should begin in 1986. It is anticipated to take four (4) years to design and fully implement the necessary controls.

TABLE 9

OPERATION REPORT SUMMARY FOR S-2
PERIOD: OCTOBER 1983 - SEPTEMBER 1984

Date Pumped	Assigned Points	Discharge Volume Acre/Feet)
October 23 - 26, 1983	25	5226
December 15, 1983	21	303
March 23 - 25, 1984	30	10345
April 5, 1984	21	1225
April 14, 1984	22	1316
May 18 - June 1, 1984	21	19248
July 2 - 4, 1984	21	3236
September 28 - October 2, 1984	24	14978

Total Pumpage	55877
Average Pumpage, 1973-1979	195880
Percent Reduction	71

OPERATION REPORT SUMMARY FOR S-3
PERIOD: OCTOBER 1983 - SEPTEMBER 1984

Date Pumped	Assigned Points	Discharge Volume Acre/Feet)
October 23 - 25, 1983	21	3754
March 23 - 25, 1984	30	5473
May 29 - 30, 1984	21	3109
July 3, 1984	21	874
September 28 - October 2, 1984	24	13973

Total Pumpage	27183
Average Pumpage, 1973-1979	55783
Percent Reduction	51

TABLE 10

NUTRIENT LOADING COMPARISON

Pump Station S-2

	Discharge (Acre-feet)	Flow-Weighted Concentrations (mg/l) Total P	Total N	Loads (tons) Total P	Total N
Pre-IAP (4/73 - 3/79)	216544	0.133	5.81	39.2	1709.6
10/83 - 10/84	55877	0.274	7.16	20.8	544.2
DER Permitted	-	-	-	18	156
SFWMD Allocation	-	-	-	18	156

Percent Reduction: 74% for Discharge, 47% for Total P, 68% for Total N

Pump Station S-3

	Discharge (Acre-feet)	Flow-Weighted Concentrations (mg/l) Total P	Total N	Loads (tons) Total P	Total N
Pre-IAP (1973 - 1979)	56825	0.096	5.06	7.4	391.3
10/83 - 10/84	27183	0.396	8.26	14.6	305.2
DER Permitted	-	-	-	7	95
SFWMD Allocation	-	-	-	11	95

Percent Reduction: 52% for Discharge, 22% for Total N, 97% Increase in Total P

C. Decision Graph

1. Backpumping and Interim Action Plan Lines.

The strategy outlined here is to temporarily suspend the IAP and allow backpumping of excess wet season runoff from the EAA when certain criteria are met. The criteria suggested are outlined here: Projections of water shortages will be determined by the cumulative reserve supply and demand curves approach previously outlined (in IV). The end of dry season target lake stage will be 11 ft NGVD. The IAP will be temporarily suspended when true lake stage, coupled with projections, indicate an end of dry season lake stage less than 11 ft NGVD. A one in five year drought stage will be used as the criterion for resuming the IAP and abandoning the EAA backpumping. This should eliminate the oscillating change in modes (pumps "on again, off again") that occurs in the current scheme.

Adoption of this strategy would allow the capture of some water at this time and serve to reduce some of the deficit of the lake. Also, having this agreement would allow for quicker response when the next shortage is predicted. When a shortage is predicted, an assessment of how severe it will become before it is over is quite subjective; therefore, quick response in a drought adds extra insurance to the chance of successfully surviving it.

2. Conservation of Lake Okeechobee Storage - Implementation.

It is the District's intention to seriously consider the declaration of a water shortage and the implementation of supply-side management after October 1, the beginning of the dry season, if the lake remains below the IAP curve. The District can not place sole reliance on this one indicator because resource conditions throughout the rest of the District, including storage levels in the conservation areas, must also be taken into account. In addition the needs and preferences of the water users must also be considered. During the 1981-1982 drought many users expressed the clear preference for high percentage cutbacks later in the dry season rather than equal percentage cutbacks through the whole season.

Toward the end of the dry season the District must consider not only the immediate needs through the end of this dry season, but the implications of having very low storage at the end of this rainfall year on the conditions at the end of the next dry season. The target level of 11 ft set for the end of May is not at an absolute level below which deliveries can not be made. It provides some level of cushion when, for instance, conditions such as those experienced during the summer of 1981 occur in which the lake continued to fall through June and July and reached a minimum in July. The 11 ft target also provides some cushion for deliveries to users not accounted for in supply-side management. Supply-side management procedures during the 1981-1982 shortage only considered direct users of lake water and not the lower east coast users who rely on the lake as a secondary backup source.

The implication of low storage levels at the end of one dry season is that the chances of shortages and the expected severity of the shortages at the end of the next dry season are both increased. Thus the District must consider whether supply augmentation measures and demand management measures are necessary during one dry season to protect against the combined likelihood of shortages both immediately and into the future.

VI. BACKPUMPING MITIGATION MEASURES

A. Continue water supply pumping at S-2 and S-3 as long as Lake Okeechobee stage remains below IAP stage as shown in Figure 36 using the water quality criteria and guidelines listed below:

Criteria:

a. Cease water supply pumping at S-2 or S-3 if inorganic nitrogen concentrations increase above 3.5 mg/L or total phosphorus increases above 0.5 mg/L when the lake is between the Interim Action Plan stage criteria and the "backpumping" stage criteria.

b. Cease water supply pumping at S-2 or S-3 if inorganic nitrogen concentration at pump station equals or exceeds 10 mg/L when the lake is below the "backpumping" stage criteria.

Guidelines:

a. Avoid pumping S-2 at rates above 2200 cfs, under all conditions.

b. Minimize pumping of S-2 and S-3 during the spring (April, May, and June), under all conditions.

c. During water supply backpumping, limit pumping rate of S-2 to 2000 cfs and at S-3 to 800 cfs.

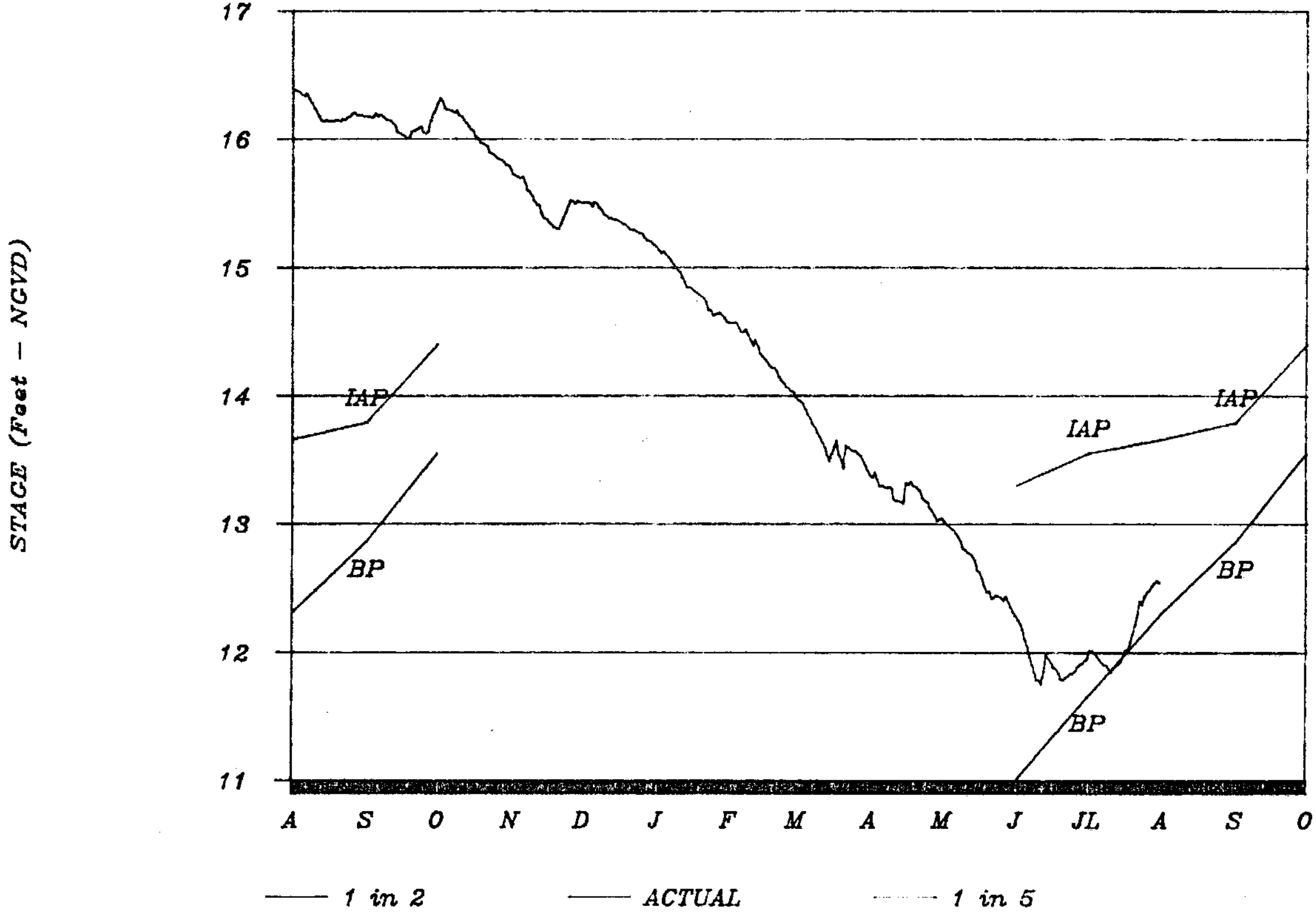
B. At the end of the rainy season, reinstate the Interim Action Plan, regardless of lake stage. The exact date of reinstatement will be discussed at the September 12-13, 1985 Governing Board meeting.

C. If Lake Okeechobee stage has not exceeded the IAP stage on October 1, 1985, initiate appropriate controls on water demand for the Lake Okeechobee service area.

D. The District's primary water management objective in the EAA is to improve the quality of the water so that it will be available for all beneficial uses. To accomplish this objective, the agricultural community, in conjunction with the District, is expected to immediately initiate engineering, economic, and feasibility

FIGURE 36. LAKE OKEECHOBEE STAGES

August 1,1984 to October 1,1985



studies of all water management alternatives for improving water quality in the EAA.

D. Water Quality Monitoring

In addition to the daily sampling at the S-2 and S-3 pump stations and the monthly sampling at the eight (8) basic stations in the lake, monthly sampling at six (6) stations in the south end of the lake will be conducted while water supply backpumping is in effect. Figure 34 (page 61) shows the locations of these stations. Two (2) of the stations (L-6 and L-7) are part of the basic eight (8) station network. Three (3) of the stations are located adjacent to the water intakes for the Belle Glade, South Bay, and Clewiston water supply utilities. The sampling trips will be scheduled approximately two (2) weeks after each regular monthly lake trip. Samples will be analyzed for routine physical and chemical parameters, chlorophyll a, and phytoplankton species and densities.

APPENDIX A

PESTICIDE/HERBICIDE LABORATORY RESULTS

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

RECEIVED
SEP 24 1984
WATER CHEM DIV.

September 21, 1984

Laboratory No. 61230

Sample of WATER

Date Received August 31, 1984

For SOUTH FLORIDA WATER MANAGEMENT DISTRICT, 3301 Gun Club Road, W. Palm Beach, FL 33406 Attn: Mr. Federico

Marks:

CERTIFICATE OF ANALYSIS OR TESTS

	HERBICIDES, all units ppm		
	2,4-D	2,4,5-TP	2,4,5-T
S2W1:	<0.001	<0.0005	<0.0005
S2W2:	<0.001	<0.0005	<0.0005
S3W1:	<0.001	<0.0005	<0.0005
S3W2:	<0.001	<0.0005	<0.0005
S4W1:	<0.001	<0.0005	<0.0005
S4W2:	<0.001	<0.0005	<0.0005
S6W1:	<0.001	<0.0005	<0.0005
S6W2:	<0.001	<0.0005	<0.0005
S7W1:	<0.001	<0.0005	<0.0005
S7W2:	<0.001	<0.0005	<0.0005
S8W1:	<0.001	<0.0005	<0.0005
S8W2:	<0.001	<0.0005	<0.0005

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Harvey C. Gray, J

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

oratory No. 61231 November 27, 19 84

mple of SEDIMENTS

te Received August 31, 1984

SOUTH FLORIDA WATER MANAGEMENT DISTRICT, P.O. Box V,
West Palm, FL 33402

arks:

CERTIFICATE OF ANALYSIS OR TESTS

TICIDES:	S2S	S3S	S4S
rin, mg/kg:	<0.0002	<0.0002	<0.0002
HC, mg/kg:	<0.0001	<0.0001	<0.0001
HC, mg/kg:	<0.0004	<0.0004	<0.0004
HC, mg/kg:	<0.0001	<0.0001	<0.0001
HC, mg/kg:	<0.00002	<0.00002	<0.00002
ordane, mg/kg:	<0.002	<0.002	<0.002
'-DDD, mg/kg:	<0.0008	<0.0008	<0.0008
'-DDE, mg/kg:	<0.0004	<0.0004	<0.0004
'-DDT, mg/kg:	<0.002	<0.002	<0.002
ldrin, mg/kg:	<0.0004	<0.0004	<0.0004
osulfan I, mg/kg:	<0.00007	<0.00007	<0.00007
osulfan II, mg/kg:	<0.0007	<0.0007	<0.0007
losulfan Sulfate, mg/kg:	<0.002	<0.002	<0.002
ion, mg/kg:	<0.003	<0.003	<0.003
thion, mg/kg:	<0.003	<0.003	<0.003
'-DDD, mg/kg:	<0.0008	<0.0008	<0.0008
'-DDE, mg/kg:	<0.0006	<0.0006	<0.0006
'-DDT, mg/kg:	<0.002	<0.002	<0.002
lion, mg/kg:	<0.003	<0.003	<0.003
lrin Aldehyde, mg/kg:	<0.001	<0.001	<0.001
ptachlor, mg/kg:	<0.0002	<0.0002	<0.0002
ptachlor Epoxide, mg/kg:	<0.00027	<0.00027	<0.00027
xaphene, mg/kg:	<0.016	<0.016	<0.016
lychlorinated Biphenyls, mg/kg:	<0.007	<0.007	<0.007

Respectfully submitted,

TECHNICAL SERVICES, INC.

Herman C. Gross

TSI

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
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Laboratory No. 61231

November 27, 19 84

Sample of SEDIMENTS

Date Received August 31, 1984

For SOUTH FLORIDA WATER MANAGEMENT DISTRICT, P.O. Box V, West Palm Beach, FL 33402

Marks:

CERTIFICATE OF ANALYSIS OR TESTS

PESTICIDES:	S2S	S3S	S4S
Diazinon, mg/kg:	<0.002	<0.002	<0.002
Malathion, mg/kg:	<0.003	<0.003	<0.003
Parathion, mg/kg:	<0.0008	<0.0008	<0.0008
M''rex, mg/kg:	<0.001	<0.001	<0.001
thoxychlor, mg/kg:	<0.003	<0.003	<0.003
Kelthane (Dicofal), mg/kg:	<0.003	<0.003	<0.003
HERBICIDES:			
2,4-D, mg/kg:	<0.001	<0.001	<0.001
2,4,5-TP, mg/kg:	<0.0002	<0.0002	<0.0002

Note: Temik (Aldicarb) residues to follow

Respectfully submitted,

TECHNICAL SERVICES, INC.

Howard A. H... [signature]

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
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JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 61231 November 27, 1984

Sample of SEDIMENTS

Date Received August 31, 1984

For SOUTH FLORIDA WATER MANAGEMENT DISTRICT, P.O. Box V, West Palm, FL 33402

Marks:

CERTIFICATE OF ANALYSIS OR TESTS

PESTICIDES:	S6S	S7S	S8S
Aldrin, mg/kg:	<0.0005	<0.0005	<0.0002
a-BHC, mg/kg:	<0.0002	<0.0002	<0.0001
b-BHC, mg/kg:	<0.001	<0.001	<0.0001
g-BHC, mg/kg:	<0.0003	<0.0003	<0.0001
BHC, mg/kg:	<0.00005	<0.00005	<0.00002
Chlordane, mg/kg:	<0.006	<0.006	<0.002
4,4'-DDD, mg/kg:	<0.002	<0.002	<0.0008
4,4'-DDE, mg/kg:	<0.002	<0.002	<0.004
4,4'-DDT, mg/kg:	<0.004	<0.004	<0.002
Dieldrin, mg/kg:	<0.001	<0.001	<0.0004
Endosulfan I, mg/kg:	<0.0002	<0.0002	<0.00007
Endosulfan II, mg/kg:	<0.0007	<0.0007	<0.0007
Endosulfan Sulfate, mg/kg:	<0.004	<0.004	<0.002
Ethion, mg/kg:	<0.008	<0.008	<0.003
Trithion, mg/kg:	<0.007	<0.007	<0.003
o,p'-DDD, mg/kg:	<0.002	<0.002	<0.0008
o,p'-DDE, mg/kg:	<0.001	<0.001	<0.0006
o,p'-DDT, mg/kg:	<0.004	<0.004	<0.002
Tedion, mg/kg:	<0.008	<0.008	<0.003
Endrin Aldehyde, mg/kg:	<0.003	<0.003	<0.001
Heptachlor, mg/kg:	<0.0005	<0.0005	<0.0002
Heptachlor Epoxide, mg/kg:	<0.0007	<0.0007	<0.00027
Toxaphene, mg/kg:	<0.016	<0.016	<0.015
Polychlorinated Biphenyls, mg/kg:	<0.018	<0.018	<0.007

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Henry C. Gray, Jr.

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
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JACKSONVILLE, FLORIDA 32201
(904) 353-5761

November 27, 1984

Laboratory No. 61231

Sample of SEDIMENTS

Date Received August 31, 1984

For SOUTH FLORIDA WATER MANAGEMENT DISTRICT, P.O. Box V, West Palm Beach, FL 33402

Marks:

CERTIFICATE OF ANALYSIS OR TESTS

STICIDES:	S6S	S7S	S8S
azinon, mg/kg:	<0.006	<0.005	<0.002
lathion, mg/kg:	<0.006	<0.006	<0.003
rathion, mg/kg:	<0.002	<0.002	<0.0008
rex, mg/kg:	<0.003	<0.003	<0.001
choxychlor, mg/kg:	<0.01	<0.01	<0.003
lthane (Dicofal), mg/kg:	<0.006	<0.006	<0.003
RBICIDES:			
4-D, mg/kg:	<0.001	<0.001	<0.001
4,5-TP, mg/kg:	<0.0002	<0.0002	<0.0002

ote: Temik (Aldicarb) residues to follow

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Harvey C. Gray, Jr.

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
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R 1/10/85

Laboratory No. 61231 January 7, 198

Sample of SEDIMENTS

Date Received August 31, 1984

For SOUTH FLORIDA WATER MANAGEMENT DISTRICT, P.O. Box V, West Palm Beach, FL 33402

Marks:

CERTIFICATE OF ANALYSIS OR TESTS

	S2S	S3S	S4S	S6S	S7S	S8S
Aldicarb, mg/kg:	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Henry C. Gray, J

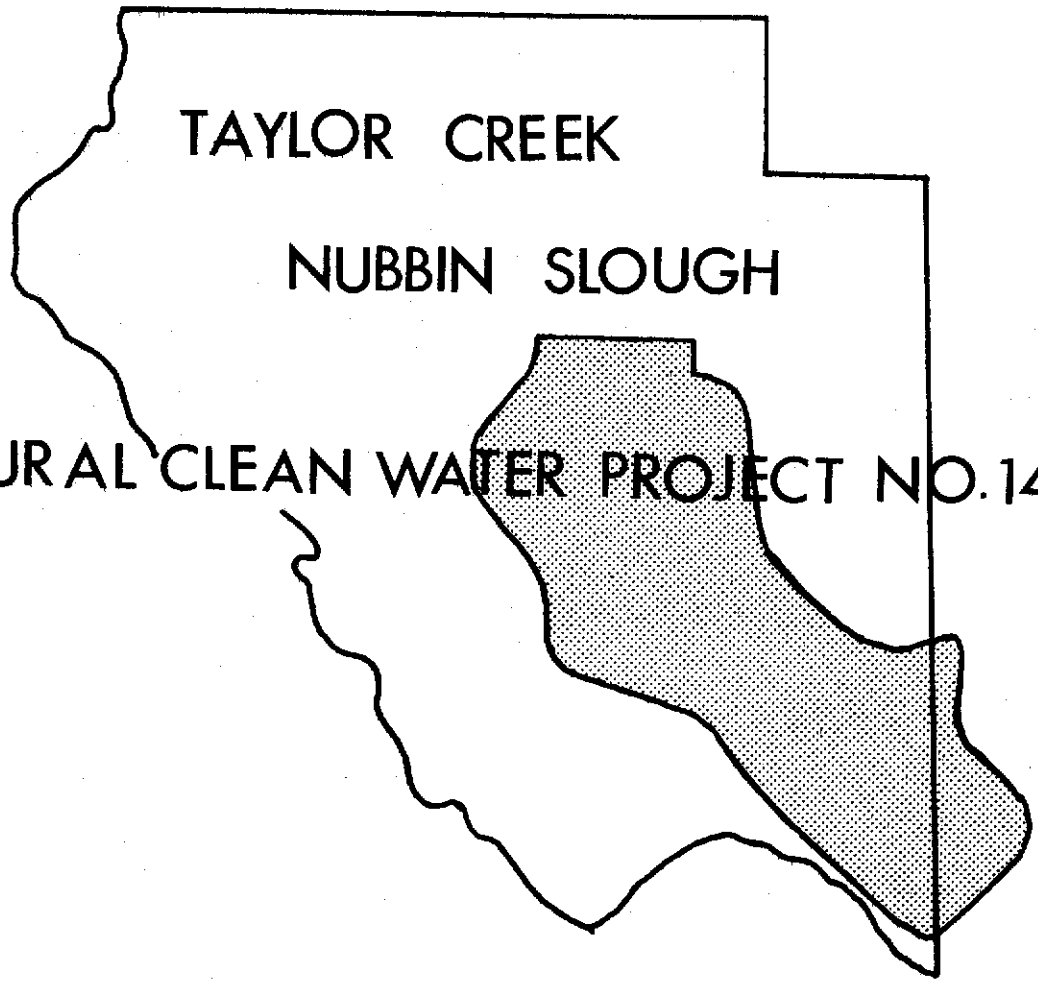
LABORATORY I.D. NO. 82145

APPENDIX B
TAYLOR CREEK NUBBIN SLOUGH PROJECT
ANNUAL PROGRESS REPORT
NOVEMBER 1984

(AVAILABLE FROM THE

DISTRICT UPON REQUEST)

TAYLOR CREEK
NUBBIN SLOUGH
RURAL CLEAN WATER PROJECT NO. 14



Okeechobee, Florida

November 1984

TAYLOR CREEK-NUBBIN SLOUGH PROJECT

RURAL CLEAN WATER PROGRAM

ANNUAL PROGRESS REPORT

Prepared By

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Gary Ritter SFWMD

Okeechobee County, Florida

November 1984

PREFACE

In the past we have reported data as it related to the total watershed. To accommodate recommendations by NCSU, we have identified 9 sub-watersheds that can be related to water quality monitoring. We elected not to change the background section, since the problems - topography, climate, rainfall and land use are virtually the same in all the sub-watersheds. For clarity we have chosen to report general data by total watershed in the narrative part of the report. More detailed information can be found by sub-watershed in the figures and tables in the appendices.

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I. BACKGROUND

The Taylor Creek-Nubbin Slough Basin has an area of approximately 110,000 acres. Water from the basin flows directly into Lake Okeechobee through the S-191 control structure operated by the South Florida Water Management District. This water is the primary source of large phosphorus loadings to the lake. Therefore, the lake is directly affected by the quality of flow from this basin, which has an adverse impact on this valuable water resource that serves all of South Florida. The lake provides public drinking water for Belle Glade, Clewiston, Okeechobee City, Pahokee and South Bay (Figure 1, Appendix 1) and is a secondary source for the lower east coast from West Palm Beach to Miami. As salt water encroachment increases along the lower east coast, the lake is expected to play an increasingly important role in the water supply for this growing area. Lake Okeechobee is used by commercial fishermen to catch panfish, catfish, and frogs valued at $5 million dollars annually as estimated by the Florida Fish and Game Commission. The lake is also a natural habitat for many species of fish and birds, and is used as a migration point for many species of duck in the winter. The tourist industry around the lake depends on the lake as an attraction for year-round recreational activity. Motels and camping areas are filled much of the year by fishermen attracted to the lake. Sport fishing is valued at $3.6 million annually. About half of this activity is in the north end of the lake immediately influenced by project area waters. The loss of Lake Okeechobee to hyper-eutrophication would be catastrophic to the economy and water supply quality of this region.

Agriculture also uses water from the lake to irrigate about 500,000 acres of vegetable crops, sugar cane, pastures, and some row crops, especially in the organic soils on the south side of the lake through a network of canals and field ditches.

The general water quality of the Taylor Creek-Nubbin Slough Basin has been well-documented through several studies conducted during the past nine years: Allen _et al_. (1975), Stewart _et al_. (1978), Federico (1977), and Federico _et al_. (1981).

All of these studies compared water quality parameters, particularly nutrient values, from different tributaries within the basin. It can be seen from the research that the primary pollution is the high concentration of nutrients that exist in most of the 99 miles of waterways in the basin. These nutrients can flow directly into the 480,000 acres of Lake Okeechobee. The documented source of the nutrients is the high density of cows (primarily dairy cows) along the 99 miles of waterways in the basin. Nonpoint source entry of animal wastes and nutrients into the streams and tributaries of Taylor Creek-Nubbin Slough occurs by two primary processes; animals standing in the waterways and discharging feces and urine directly, and from runoff from pasture areas, frequently through field ditches. In the hot south Florida climate, dairy animals, particularly, seek relief from heat stress by wading in streams or other bodies of water when they are available. In the past, animals have been permitted to wade freely to relieve heat stress and thus reduce milk production losses that would occur in a heat-stress environment.

From 1974 to the present, nutrient concentration data have been collected at three sites along one stream in the watershed that shows the direct effects of animals standing in a stream. Table 1 (Appendix 1) shows the effects from Otter Creek for two years, 1978 and 1979, when the data were most complete. Samples collected downstream from an area where cattle lounge (Otter Creek at

State Road 68) show a dramatic increase in the phosphorus and nitrogen concentrations in the water compared to samples collected above this cattle-lounging area (Otter Creek at U.S. Highway 441).

These high concentrations of nutrients are contributing to the eutrophic state of Lake Okeechobee. The eutrophic state affects all uses of the lake by reduced water quality. Joyner (1974), Dickson et al. (1978) and Brezonik et al. (1979) have evaluated the trophic state of Lake Okeechobee especially as related to the nutrient loading rates. All investigations have concluded that the lake is in and/or proceeding to the eutrophic state. Lake Okeechobee is designated as a Class I water source and the degradation of the water affects all uses of the lake.

The location of the critical area has largely included the entire Taylor Creek-Nubbin Slough Basin. However, in the original project application, it was estimated that the most critical area (out of the 93,500 acres designated as critical area) would be that acreage adjacent to any water (Figure 2, Appendix 1) and would encompass around 64,800 acres. Based on what has been learned from the planning to date, this original smaller acreage was a fairly accurate estimate of the critical acreage needing treatment.

Using the knowledge gained from the planning completed so far, the following criteria were applied in refining the critical area designated within the Taylor Creek-Nubbin Slough Basin:

a. All dairy farms are considered critical areas.

b. All beef cattle farms that have been extensively drained are considered critical areas.

c. All areas within one quarter mile on each side of a stream, ditch or channel that holds water year-round are considered critical.

Using the above criteria and deleting urban areas that fall within these perimeters, the critical area that needs treatment is 63,109 acres.

The committee has set several goals for the project to measure the success of implementing the selected Best Management Practices (BMP's) in the project area. The first of these goals is a 50% reduction of phosphorus and nitrogen loadings entering Lake Okeechobee through the S-191 structure. Since the clarification of point source for the project (i.e., that all dairies are considered to be nonpoint sources) there are no identified point sources or industrial and municipal sources of pollution. A nutrient concentration reduction at the S-191 outflow location would be an accurate assessment of the reduction of agricultural nonpoint source pollution taking place. The second goal is to have at least 47,331 critical acres (75% of the critical area) under contract. A third and important goal is to have all dairy farms in the project area under contract.

Over 95% of the project area is devoted to agricultural use, the other 5% (4,775 acres) is residential and a state institution. A sampling site just downstream from the state institution has shown no significant contributions to the problem in the past. The residential area is low density and not considered to be a problem. There are currently no new construction projects or any nonagricultural sources of pollution in the basin that might contribute to the problem.

There are several factors that contribute to the agricultural pollution in the basin. The topography is flat and the soil types are poorly drained, which causes standing water in the project area during the rainy season (June through September). This poor drainage has led to extensive ditching for improved drainage in the project area. These factors, along with 50 inches average rainfall a year, make the watershed system susceptible to being easily flushed directly into Lake Okeechobee.

There are presently 24 dairy barns on 33,000 acres. These dairies are milking more than 23,000 cows with an additional 5,000+ animals on the dairies at any given time. These dairies are located on or near the major waterways.

Approximately 49,000 acres of the basin are used for beef production on 56 farms or ranches that graze around 25,000 head. Of this area, 30,000 acres are considered critical, which represents 35 farms and 21,000 head of cattle. Cattle ranching in this part of Florida is primarily a cow/calf type operation.

The large number and high density of animals in the project area, especially around dairies, is the major problem. Animals lounging in and around water courses are the primary nonpoint sources of pollution by direct animal deposits. Runoff from surrounding pastures where animals are kept is another primary indirect nonpoint source.

Most of the pastures in the project area are improved and fertilized, which contribute to the pollution problem. All the dairies in the project have waste catchment systems, but most are not properly managed which also contributes to the problem.

There are roughly 1400 acres of citrus growing in the basin. These citrus groves require extensive drainage and irrigation to insure proper growth of the trees. Deep ground water from the Floridan aquifer, together with high dissolved solids including chloride, is commonly used for irrigation supplies. Dissolved solids and chlorides may be exceptionally high in nearby watercourses during periods of irrigation when rainfall and runoff are low. Many groves are changing to low-volume irrigation systems which should reduce the salinity problem. Monitoring of chloride and dissolved solid concentrations in the basin will continue to assess the nature and magnitude of this problem.

Prior to the project approval, approximately 90% of the farms in the project area had conservation plans. All the dairy barns have some type of waste management system. Some other measures have been undertaken by individuals but not of any significance that would affect project accomplishments.

II. STATUS OF IMPLEMENTATION

In FY 1984, thirteen new contracts were signed, which brought the total number of active contracts to 28. One contract was canceled due to a change in ownership and land use; no funds were expended. From the contracts signed, 39,726 critical acres are now under contract. These signed contracts include 27,067 acres from dairies, or about 82% of the 33,000 acres under dairy land use. Of the total 63,109 critical acres, 23,383 are not currently under contract. A total of $642,424.00 in cost-share funds have been obligated.

Requests for contract and water quality planning are on schedule. Of the 54 farms identified in the critical area, all but 12 have been planned. The Soil Conservation Service is currently planning two of these which will be completed shortly. The SCS has provided its interagency monthly status report on water quality planning which can be found in Appendix 3.

Goals for FY 1985 are 12 more contracts signed by mid-year and 60% of the BMP implementation completed. Attainment of these goals would exceed the original goals set for the project. Forms ACP-305, RCWP-3 and RCWP-7, found in Appendix 3, provide more specific details on goals and accomplishments. In FY 1985 we will move from an active planning stage to an active implementation stage.

Progress of implementation as a whole has been good and projected dates of accomplishments for the project should be met or exceeded. In the past fiscal year, 507 best management practices were completed on the ground in the critical area (this includes management and installed BMP's). Cumulatively, 8,260 critical acres are served by installed BMP's and 34,598 critical acres are served by management BMP's. Appendix 1 contains tables that summarize BMP implementation by sub-watershed. These summaries show an installed acres served total and a management acres served total. These figures may not equal the cumulative BMP acres served total. In computing these totals, we did not count more than once each critical acre treated when that acre was treated by more than one BMP. Therefore, we feel these totals represent an accurate assessment of treated acres compared to project critical acres.

To date, $263,321.00 cost-share monies have been earned, $642,424.00 have been obligated. Because of the payment limitation many BMP's have been installed as non-cost shared. State monies and farmer contributions have paid for these practices. We have accounted for the critical acres served by these BMP's, but are working on a better accounting system for the monies spent by the farmer and the state. These figures will be available at a later date and can be provided. Estimates for other contributions were made based on the costs entered on the AD-862's submitted. Summaries of funds earned and obligated can be found in Table 11.

In summary, BMP implementation is progressing well. Implementation has been completed on 4 farms and 17 farms have at least one BMP installed. Table 12 shows the critical acres by sub-watershed, the number and percentage of critical acres under contract, and number of farms having critical acres in the watershed and the number of farms under contract. Figures 3 through 10 show the critical area in each watershed and Figures 11 through 17 show the location of contracted farms in each watershed.

South Florida Water Management District has reported a 15% reduction in phosphorus loadings from the Taylor Creek-Nubbin Slough Basin. This is discussed in more detail in Section III by watershed. As more BMP's are implemented, data related to reductions can be more closely tied to BMP's.

III. WATER QUALITY MONITORING

AND

IV. WATER QUALITY TREND ANALYSIS

Parts III and IV have been combined to associate monitoring and trends together by sub-watershed.

Monitoring Strategy

The water quality monitoring network in the Taylor Creek-Nubbin Slough watershed described in the 1982 water quality monitoring report (Ritter and Allen, 1982) consisted of 43 sites. In the subject time period subsequent to that report (1982-1983), this monitoring network was streamlined by reducing the network to a total of 26 stations, 23 of which are at instream locations, and the remaining 3 at dairy waste lagoons. Figure 18 depicts the revised water quality monitoring network as of September 1984. Table 13 contains a description of these locations. Table 14 is a list of the discontinued sampling sites. After evaluation of the data record to date and the rationale used for choosing the original monitoring network, it was felt that the data collection program could be streamlined by eliminating the designated stations without compromising either the area of coverage of the degree of resolution for evaluation of the BMP implementation program.

The water quality goals and objectives of the Florida RCWP program remain: (1) to document baseline water quality data prior to BMP implementation; (2) to monitor the development and implementation of BMP's throughout the Taylor Creek-Nubbin Slough watershed; (3) to evaluate the effectiveness of BMP's through water quality monitoring in alleviating high nutrient loads (mainly phosphorus) on a subwatershed scale; (4) to reduce the overall phosphorus contribution from the Taylor Creek-Nubbin Slough watershed to Lake Okeechobee at S-191 by 50 percent.

Materials and Methods

The 20 instream water quality monitoring stations continue to be collected on a biweekly schedule. Sample collection at the three lagoon stations has been reduced to a quarterly schedule.

Water quality samples are analyzed for the following chemical and physical paramenters:

Chemical	Physical
Total-P	pH
Ortho-P	Specific Conductivity
NO_3	Turbidity
NO_2	Color
NH_4	
TKN	

A detailed description of the analytical, hydrological, and nutrient load calculation methodology is presented in Ritter and Allen (1982). The hydrological monitoring network contains 5 stage recording devices in upper Taylor Creek (N. W. Taylor Creek - 1, Otter Creek - 2, Williamson Ditch - 1, and upper Taylor Creek outflow - 1). Lower Nubbin Slough has 7 stage recording devices that were installed in 1983 (Mosquito Creek - 2, Nubbin Slough - 1, Henry Creek - 1, Lettuce Creek - 3). In addition, there are eight rainfall and groundwater stations in upper Taylor Creek and two rainfall stations in lower Nubbin Slough. A comparison of 1983 rainall to the period-of-record rainfall for the Taylor Creek-Nubbin Slough watershed is presented in Table 15 (Appendix 1).

Water Quality and Hydrologic Monitoring

The 1983 annual report documented the baseline water quality data for the years 1978 through 1981, and also presented 1982 water quality data which was collected during the first year of BMP implementation.

For the purpose of evaluation of impacts of BMP's on water quality, the data record has been divided into three distinct periods. The first is the baseline water quality collected during the years 1978 through 1981. This documents water quality prior to BMP implementation. The second period includes data collected or yet to be collected during the period of BMP implementation. This includes data for 1982 and 1983. The third and last period is data to be collected subsequent to installation of all BMP's in the watershed. Obviously data currently being collected and evaluated is grouped in the implementation period. Water quality data summarized for 1983 at each of the sampling stations throughout the Taylor Creek-Nubbin Slough watershed are presented in Appendix 4. Also presented in Appendix 5 are time series graphs for selected water quality stations from 1978 through 1984. A continuation of these time series plots into the post-BMP phase of the program will be used as means of visually illustrating the effectiveness of BMP's in improving water quality.

As noted previously, installation of stage recorders in the lower Nubbin Slough basin was accomplished in May of 1983. These recorders have, over the past 18 months, provided a means of quantitatively measuring flows at Mosquito Creek, Nubbin Slough, Henry Creek, and Lettuce Creek. Data now being generated by these newly installed stage recorders suggest that 1982 flows may have been underestimated. These data also suggested that the areas of hydrologic contribution (watershed surface area) calculated for each of these subwatersheds needed to be adjusted. The areal extent of boundary adjustments that have subsequently been made are presented in Table 16 (Appendix 1).

Annual loads of phosphorus and nitrogen species for 1983 are presented in Tables 17 and 18 respectively (Appendix 1) for each of the eight major sub-watersheds throughout the basin. It should be noted that the loads for the 4 newly instrumented watersheds were calculated only for a 7 month period, June 1 through December 31, 1983. Since those months include the bulk of the wet season (66.5 percent of total annual precipitation) when the majority of flow occurs, they reflect the relative magnitudes of the loads that would be expected to occur over an entire 12 month period but are as such, under-estimates of what actually did occur.

Total discharges during 1983 for each of the 8 major sub-watersheds are presented in Table 19 (Appendix 1). Again the period of record for the 4 southernmost tributaries was June 1 through December 31 and as with the mass loads, these numbers are underestimates of annual totals but provide insight into relative magnitudes.

Annual total discharge and nutrient mass loads at S-191 for 1983 have been estimated due to mechanical problems at control gates that have occurred during the year at the structure thus creating some uncertainty in the accuracy of measured results there.

OTTER CREEK

Presented in Tables 20 and 21 (Appendix 1) are annual means and standard deviations for selected parameters at the downstream water quality stations in Otter Creek and East Otter Creek, respectively. Concentrations presented are for the period of January 1978 through July 1984 which represents pre-BMP as well as initial BMP implementation data. Figure 19 (Appendix 1) depicts the nutrient loads exhibited in Otter Creek from January 1978 through December 1983. In summary, the major points that can be noted from these tables and figures are:

(1) Total phosphorus and total nitrogen concentrations decreased 14 percent and 38 percent, respectively, from 1978 through 1984 in Otter Creek.

(2) Total phosphorus and total nitrogen loads were as high as those exhibited during the pre-BMP years of 1978 and 1979; however, flow discharges during 1984 show an increase of 58 percent and 30 percent over those exhibited during 1978 and 1979, respectively. The increased discharge has contributed to the increase in total nitrogen and total phosphorus loads in this sub-watershed. An interesting side note is that from July through October 1983 the Okeechobee County Road Department performed maintenance operations by dragline in the Otter Creek channel. This increased the drainage and runoff throughout Otter Creek and thus may have caused the higher nutrient loads and slightly elevated nutrient concentrations over those exhibited during 1981 and 1982.

(3) During September 1983, fencing installation for a major portion of

East Otter Creek above station 19 was completed. Early water quality results after this date show some decreases in total phosphorus (35 percent) and total nitrogen (43 percent) concentrations from September 1979 through July 1984.

LITTLE BIMINI

Summaries of annual means and standard deviations and annual nutrient loads for the Little Bimini sub-watershed are presented in Table 22 and Figure 20 (Appendix 1), respectively. As in past reports, discharges for Little Bimini have been estimated. The procedure has been described in Ritter and Allen (1982). The major trend in Table 22 and Figure 20 is that total phosphorus and total nitrogen concentrations have increased 140 percent and 89 percent, respectively, from 1981 to present. These increases have occurred in conjunction with the increased rainfall during the last 2.5 years. They also can be attributed to a direct discharge from a second stage dairy lagoon which was discovered to have a break in the surrounding levee. Effluent from the lagoon was then being flushed directly into the headwaters of Little Bimini. This washout was repaired in March of 1984 and since then there has been noticeable decreases in total phosphorus and total nitrogen concentrations.

N.W. TAYLOR CREEK

Summaries of annual means and standard deviations and annual nutrient loads are presented in Table 23 and Figure 21, respectively. There has not been a great deal of BMP activity in this sub-watershed. In the past, phosphorus and nitrogen concentrations at N.W. Taylor Creek have averaged less than .50 mg/l and 2.0 mg/l, respectively. Despite increased rainfall from 1982 through 1983 nitrogen and phosphorus concentrations have remained consistent with those reported from 1978 through 1981. Slight increases in nitrogen and phosphorus concentrations through mid-1984 may be attributed to an increase in the number of animal units in the headwaters of N. W. Taylor Creek. An encouraging note is that nitrogen and phosphorus loads actually showed a decrease in 1983 of 60 percent and 45 percent, respectively, over those exhibited during 1982; this is probably due, however, to the fact that discharges decreased by 29 percent from 1982 to 1983 as well.

WILLIAMSON DITCH

Summaries of annual means, standard deviations, and annual nutrient loads for the Williamson Ditch sub-watershed are presented in Table 24 and Figure 22, respectively. Major points from Table 24 and Figure 22 are:

(1) Total phosphorus and total nitrogen concentrations have both decreased 39 percent from 1978 through 1983. Significant BMP implementation has occurred in the headwaters of Williamson Ditch during 1984 and may be responsible for the lower concentrations exhibited in the first half of 1984.

(2) Nutrient loads, discharge, and rainfall during 1983 have been consistent with those exhibited in 1978, 1979 and 1982.

During those years that have been characterized by similar rainfall and discharge (1978, 79, 82 and 83) the sub-watershed has exported essentially comparable loads of N and P.

MOSQUITO CREEK

Table 25 summarizes annual means and standard deviations of nutrient species in water samples from the Mosquito Creek sub-watershed. To date there have been no BMP's implemented within this sub-watershed and, therefore, data from 1978 through July 1984 can be considered as pre-BMP implementation data.

Trends in mean annual nutrient concentrations in this sub-watershed are similar to those exhibited in other sub-watersheds over this subject period, that is periods of greater rainfall and runoff are characterized by higher concentrations. The magnitude of concentration change on this watershed may have been affected by decreases and subsequent increases in the amount of dairy activity in the area over this period.

Up until 1980 there were six dairy barns in operation in this sub-watershed. Annual total P and total N concentrations were as high as 3.60 and 10.16 mg/l respectively.

Through 1981 and 1982, three of the six barns were closed down with a corresponding decrease in the number of animals being kept and milked. Total P and total N concentrations dropped by about 40 percent from previous levels. Subsequent to this time, 1983 to present, the level of intensity has increased. There are now five milking barns in active operation. Nutrient concentrations are again approaching their 1980 levels.

As has already been established by previous studies and reconfirmed here, nutrient decrease or increase is often positively correlated with rainfall and discharge. Since the above referenced decrease in dairy activity occurred simultaneously to a period of decreased flow, and the subsequent increase in activity paralleled a return to more normal rainfall/discharge conditions, it is impossible to know how much of which factor (flow or dairy activity) can be attributed to as the reason for the observed changes in nutrient concentrations. Undoubtedly, both were important factors.

NUBBIN SLOUGH

A summary of annual mean concentrations and standard deviations for selected parameters in the Nubbin Slough sub-watershed are presented in Table 26. In the past, water quality at the outfall to the L63N canal has reflected the runoff and discharge from a single dairy which is located just upstream of the water quality sampling station at the confluence of Nubbin Slough with the canal. Due to its location and poor wastewater effluent management and disposal techniques, the contributions of this one operation tend to overpower and mask effects of BMP installation that occur over the remainder of the watershed. It is of some interest to note, however, that since 1982 and the beginning of the period of BMP implementation in the watershed, that concentrations of total N and total P have shown a continually decreasing trend. Preliminary 1984 data suggests that total N and P concentrations will be roughly half of their 1981 levels. In addition, this decreasing trend has occurred during a period when annual rainfall and runoff was increasing which is contrary to the historical cause/effect trends well documented on these watersheds. BMP's are being implemented on the other three dairy operations upstream in the watershed. At this time, there is no other readily apparent reason for the observed decline.

HENRY CREEK

Table 27 contains a summary of annual mean concentrations and standard deviations for selected parameters in the Henry Creek sub-watershed. Total P and total N concentrations were following an increasing trend from 1981 through 1983. Preliminary 1984 data shows mean concentrations to be somewhat lower, returning to or near 1981 levels.

LETTUCE CREEK

A summary of annual means and standard deviations for selected parameters in the Lettuce Creek sub-watershed are presented in Table 28. BMP implementation has just started at the one dairy in this sub-watershed. Nutrient concentrations continue to be characteristically lower in Lettuce Creek than in any of the other tributaries throughout the basin.

S191 AT LAKE OKEECHOBEE AND UPPER TAYLOR CREEK

A summary of annual means and standard deviations for selected parameters at S191 is presented in Table 29. Figures 23 and 24 graphically depict annual phosphorus and nitrogen loads at S191 and Upper Taylor Creek, respectively. The major points in Table 29 and Figures 23 and 24 are:

(1) Mean annual total phosphorus concentrations for S191 at Lake Okeechobee are 15 percent lower in 1984 than they were in 1978.

(2) Mean annual total nitrogen concentrations at S191 are 5 percent lower in April 1984 than in 1978.

(3) Total phosphorus and total nitrogen loads for 1983 at S191 are 21 percent and 36 percent lower, respectively, over those exhibited during 1982. (Note 1983 loads have been estimated for S191).

(4) Mean annual nutrient loads for Upper Taylor Creek have actually increased slightly from those exhibited during 1982. This increase has brought nutrient loads for Upper Taylor Creek back up to the level experienced during 1979.

In summary, the response of total N and P concentrations on each of the sub-watersheds in the basin is varied. For the most part, they responded in 1983 to rainfall and consequent runoff in a manner comparable to previous years when rainfall was of similar magnitude. In general, concentrations increased with increasing flows. There were two notable exceptions to this rule. These were the Williamson Ditch and Nubbin Slough watersheds. BMP implementation is well underway in Williamson Ditch and at three of the four dairy barns in Nubbin Slough. At present, BMP implementation is a plausible explanation for these new trends. It should be emphasized, however, that there are too many variables in these natural systems to make conclusive judgements with such preliminary and short-term data.

V. GENERAL ASSESSMENT

The Taylor Creek-Nubbin Slough project has progressed farther than had been expected in the past year. The year began with a cautious outlook, but good weather and stronger economic conditions have produced a fruitful year. It is felt that contractual goals will be exceeded along with critical acres treated. Planning is all but complete and we now move into the implementation phase of the project.

Funding is still considered adequate and no changes have been recommended by the COC or the LCC. Approximately 58 percent of the cost-share funds have been obligated and sufficient funds are left to cover the remaining contracts expected to be signed.

The State of Florida has committed funds in the Upper Taylor Creek watershed for implementing BMP's at 100 percent. These funds have been applied to the 25 percent that RCWP did not pay. The State's uncommitted funds from the Upper Taylor Creek watershed have been made available to farmers in other parts of the project at $2500.00 per farm until funds run out.

Because of the size of our farms, many contracts have exceeded the payment limitation and many BMP's are being installed an non-cost shared. A summary of the funds obligated can be found in Table 11 in Appendix 1.

Project participation is now in line with the project goals set. Better economic conditions have made monies available for farmers to participate. Also the state has mandated that the state's polluted waters be cleaned up. Farmers state-wide have begun to change their operations to reduce their contributions. Farmers in our area are using this program to cleanup their operations. Most of the dairy farmers now in our area moved out of urban areas because of pressure to cleanup their operations. It is felt that the outlook of a state regulatory program to cleanup waters has also increased participation in our program.

As stated earlier, we are moving from the planning phase to the implementation phase. The installation of best management practices has progressed well this year. We have set an aggressive goal (60% of the implementation completed) for FY 1985. If the weather cooperates and the economy stays strong, this goal should be met.

In the third program area, the water quality monitoring data is more than adequate. The South Florida Water Management District has an excellent program that can show what effect the installation of BMP's will have on water quality. A good history of water quality records will provide the basis for identifying and quantifying any trends that result from BMP installation.

The information and education program has been adequate. All agencies have participated in articles, project tours, media coverage, and speaking engagements. CES will complete work on a slide-tape presentation and related publications. A local waste utilization demonstration will be monitored and a related field day held. CES plans to publish a regular newsletter to keep landowners and interested citizens aware of the progress of the project.

FY 1984 has been the best year yet. Much has been accomplished and everyone involved feels the goals and objectives should be met or exceeded.

FY 1985 looks to be a promising year for finalizing contracting and implementing a major portion of the BMP's. Success of the project still lies in the results of the water quality monitoring after BMP installation. Still, the enthusiasm and cooperation of those actively working to make this project a success has not waivered. We all feel that the hard work and extra effort will result in long-term water quality improvement in the Taylor Creek-Nubbin Slough Basin and in Lake Okeechobee.

VI. PROJECT CHANGES

The COC and LCC are recommending that this report come due at a later date. Trying to compile this data at the same time that all agencies are closing out their fiscal year puts a heavy burden on local staffs. As the project progresses, more data will be available and more analyzation will be required. To continue to provide an accurate update, we feel more time is needed. As for this project, if a January 30 deadline was used, monitoring data would be available for the current year and not a year behind.

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APPENDIX 1

FIGURES AND TABLES

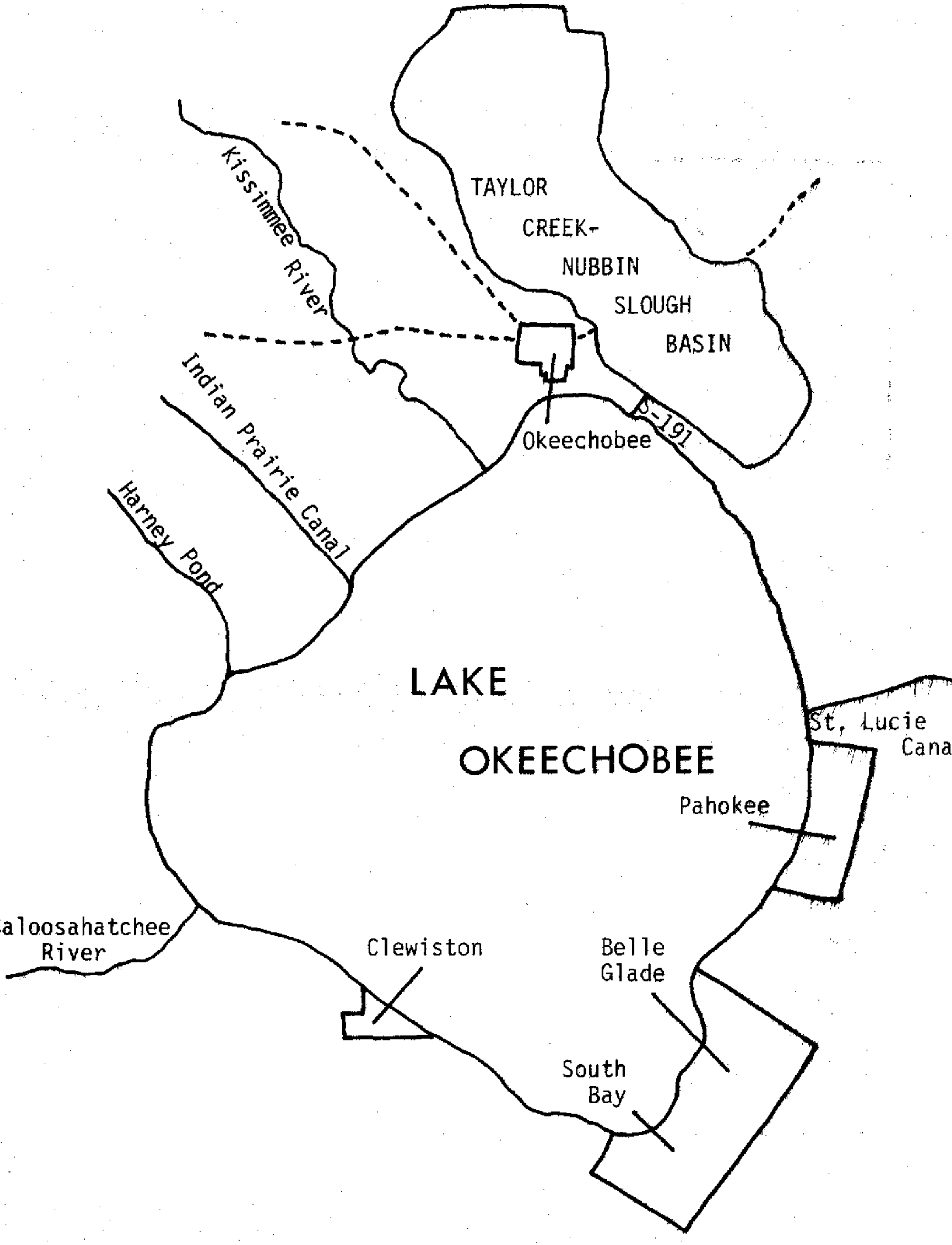


FIGURE 1. PUBLIC WATER SUPPLY INTAKES

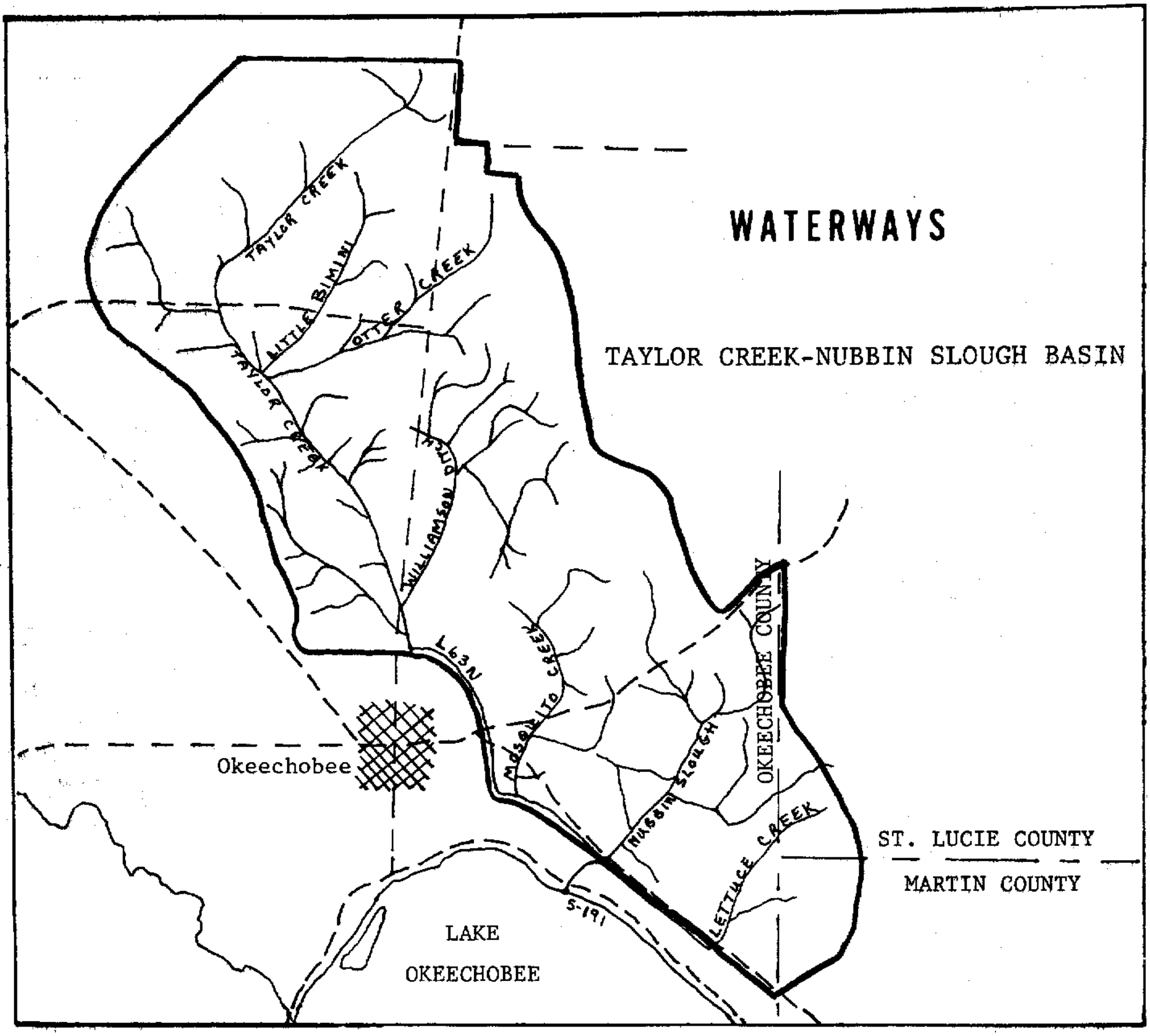
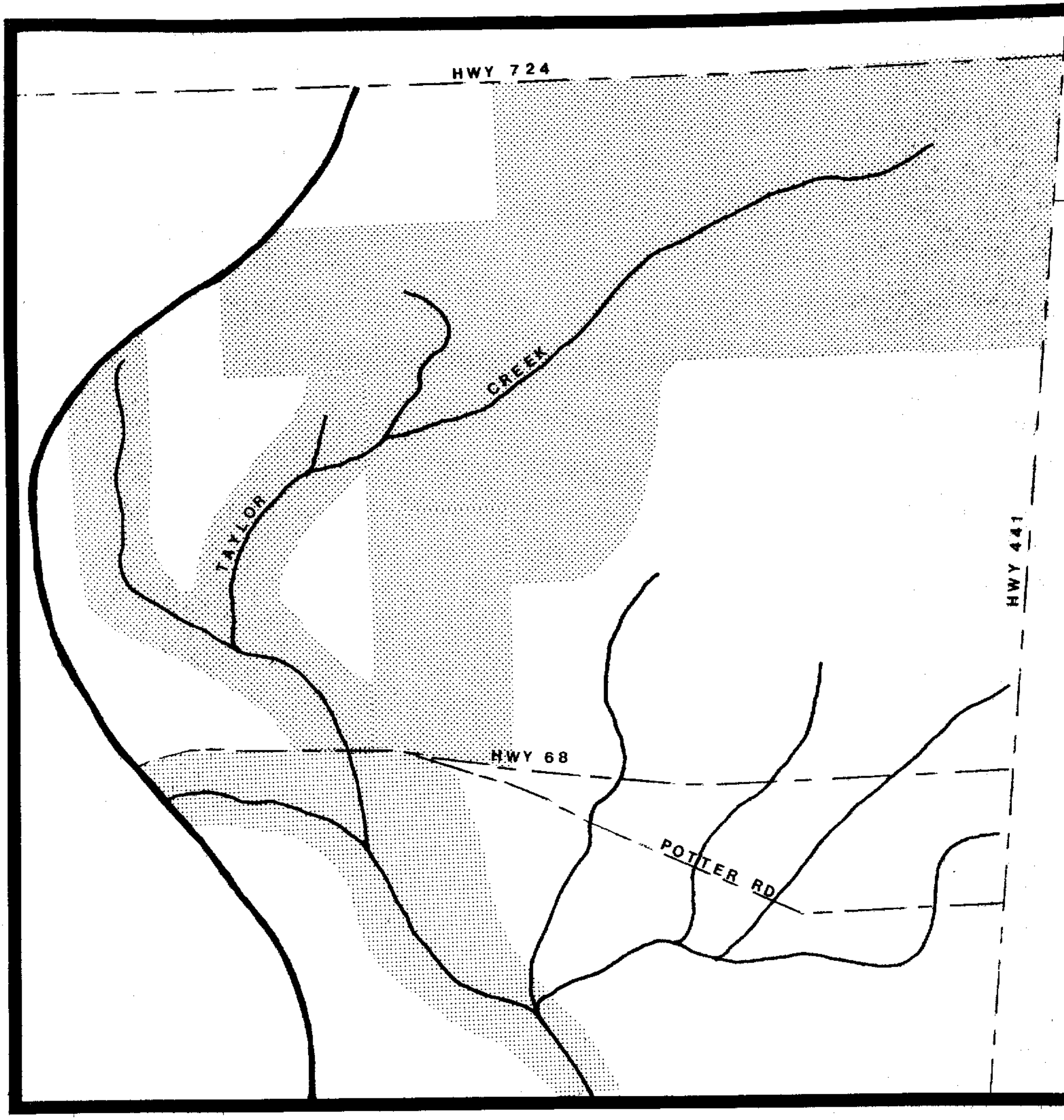


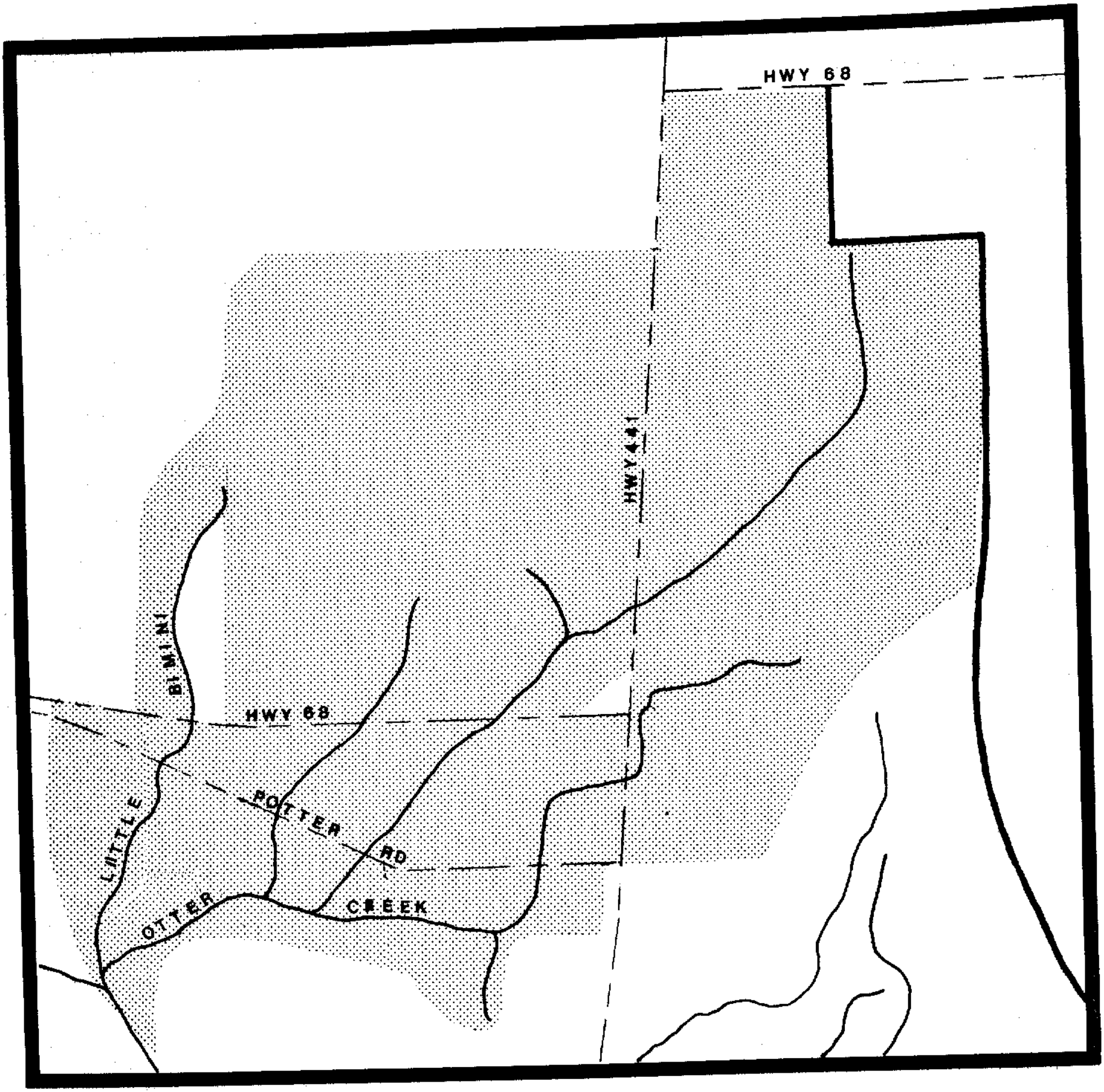
FIGURE 2. WATERWAYS IN TAYLOR CREEK-NUBBIN SLOUGH BASIN

FIGURE 3. CRITICAL AREA IN TAYLOR CREEK-NUBBIN SLOUGH



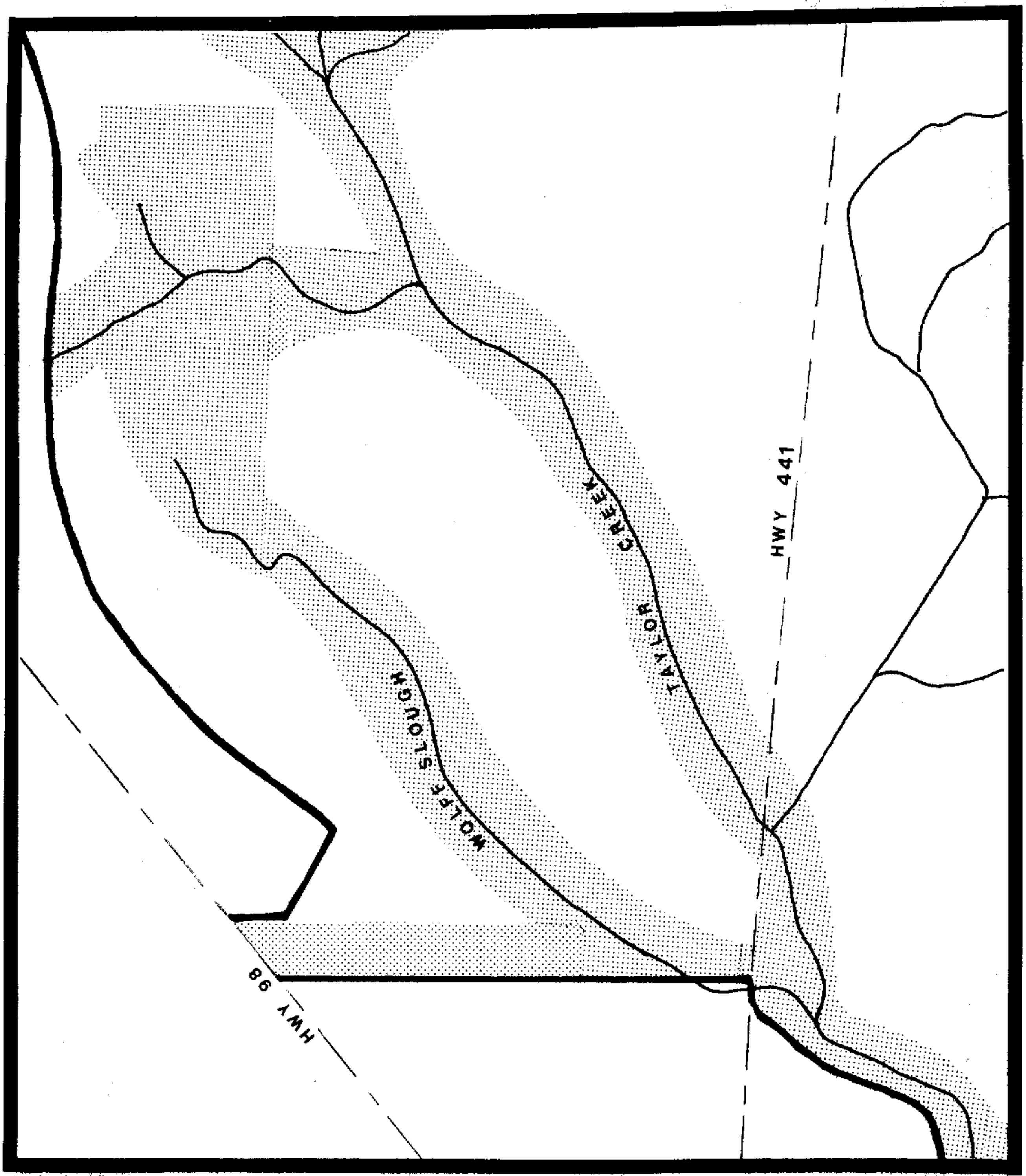
Critical Acres:
11,865

FIGURE 4. CRITICAL AREA IN N.W. TAYLOR CREEK SUB-WATERSHED



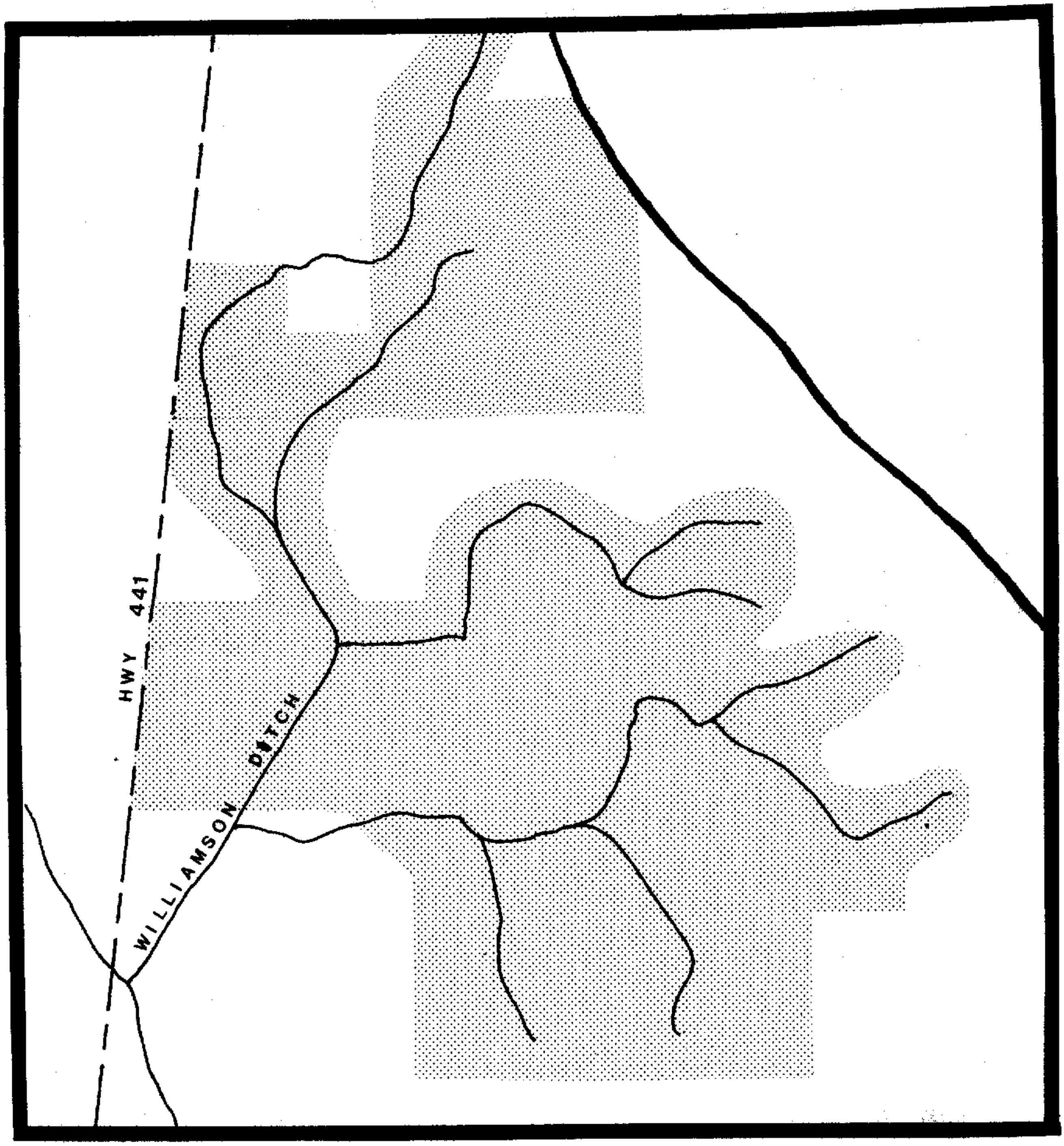
Critical Acres:
Little Bimini 3,853
Otter Creek 10,753

FIGURE 5. CRITICAL AREA IN LITTLE BIMINI AND OTTER CREEK SUB-WATERSHEDS



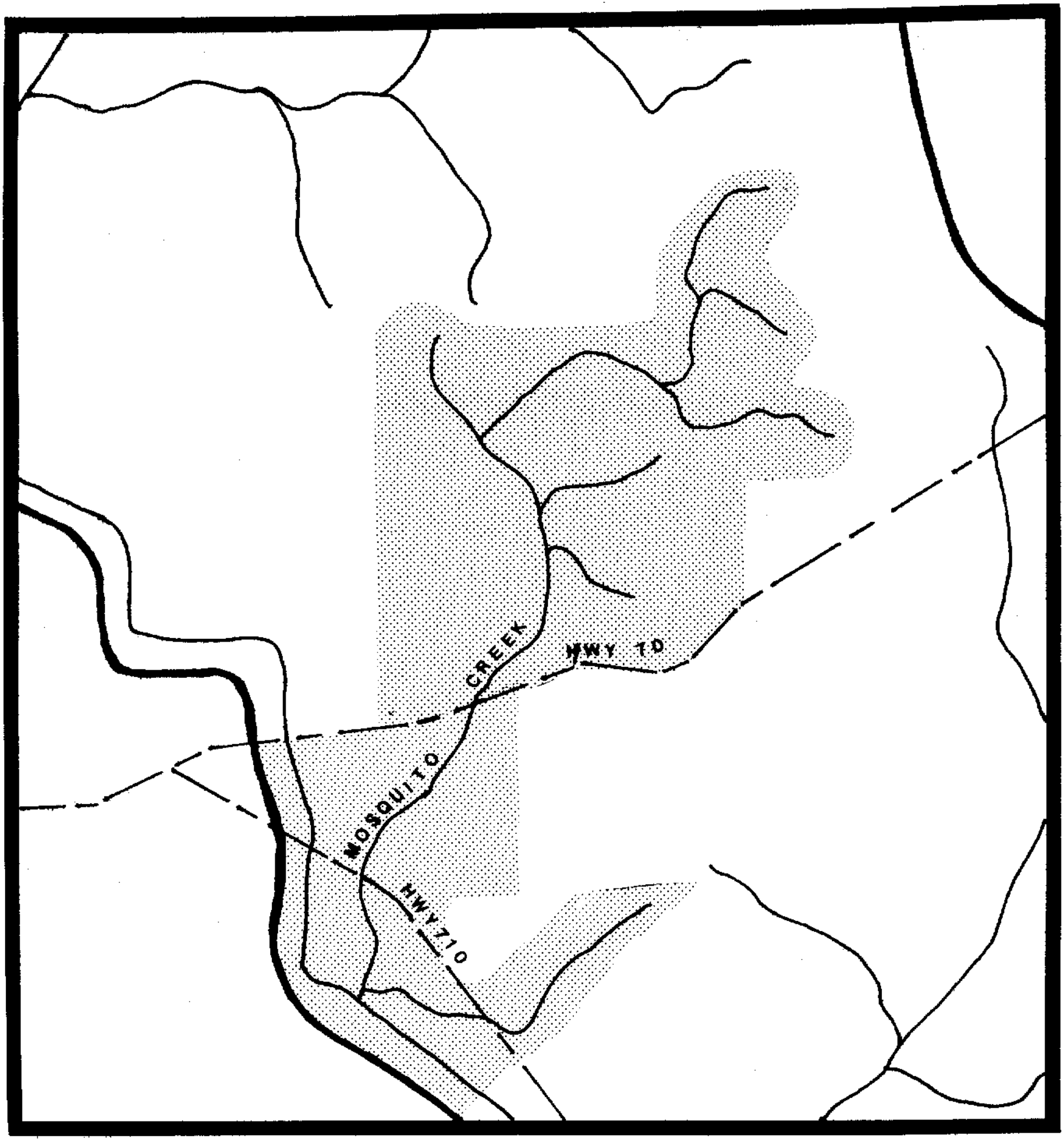
Critical Acres:
6,464

FIGURE 6. CRITICAL AREA IN MAIN TAYLOR CREEK SUB-WATERSHED



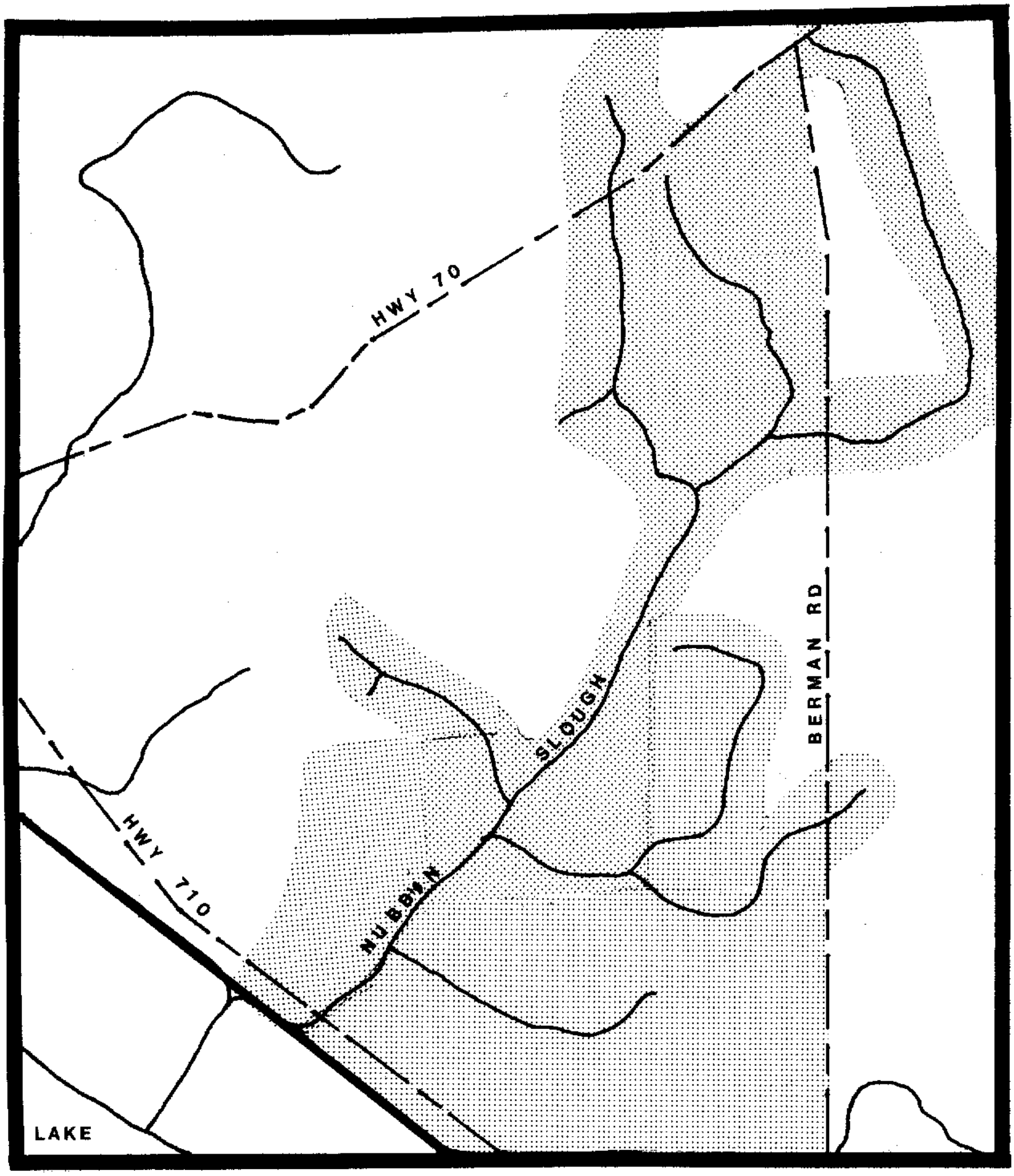
Critical Acres:
9,774

FIGURE 7. CRITICAL AREA IN WILLIAMSON DITCH SUB-WATERSHED



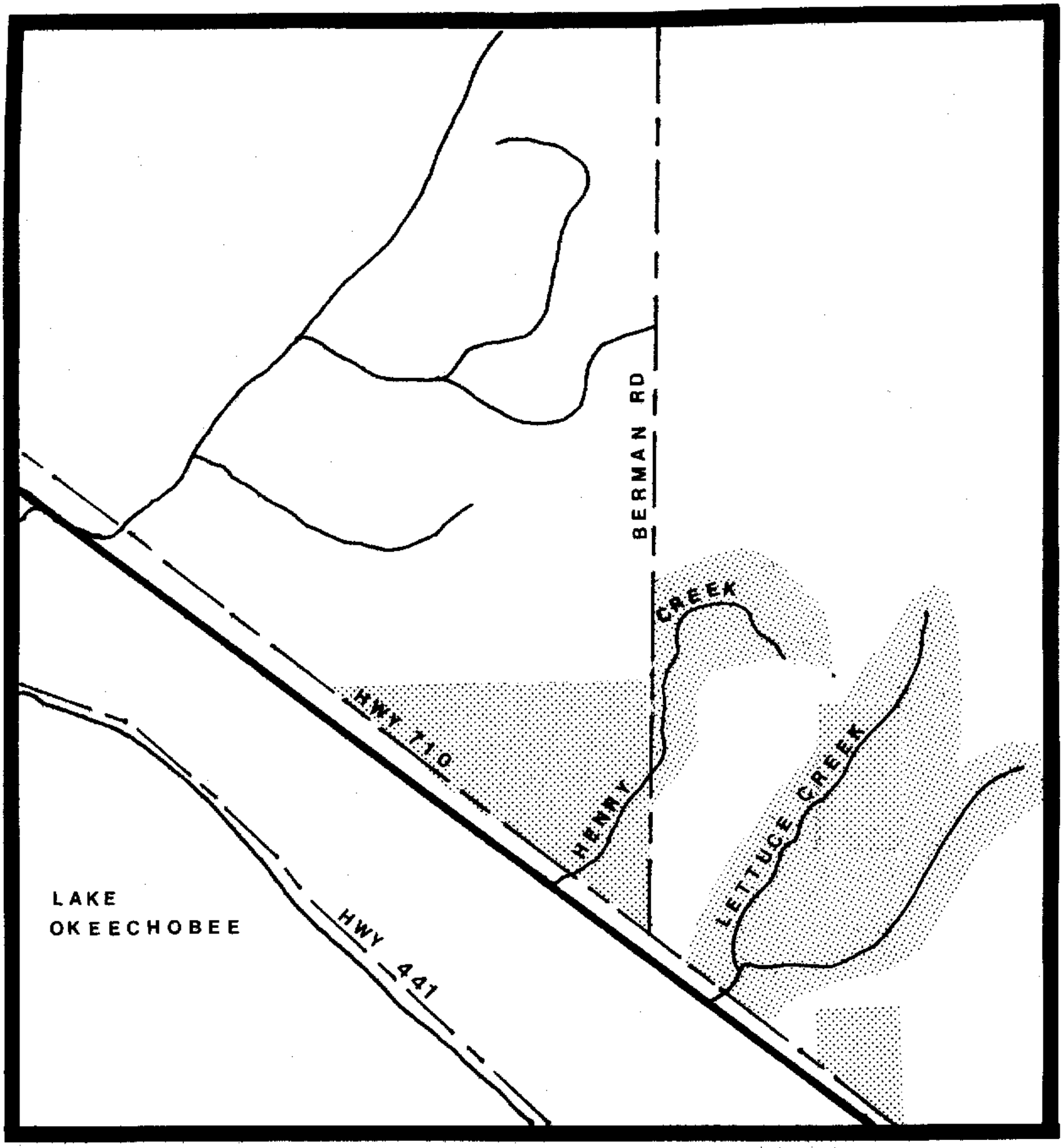
Critical Acres:
4,101

FIGURE 8. CRITICAL AREA IN MOSQUITO CREEK SUB-WATERSHED



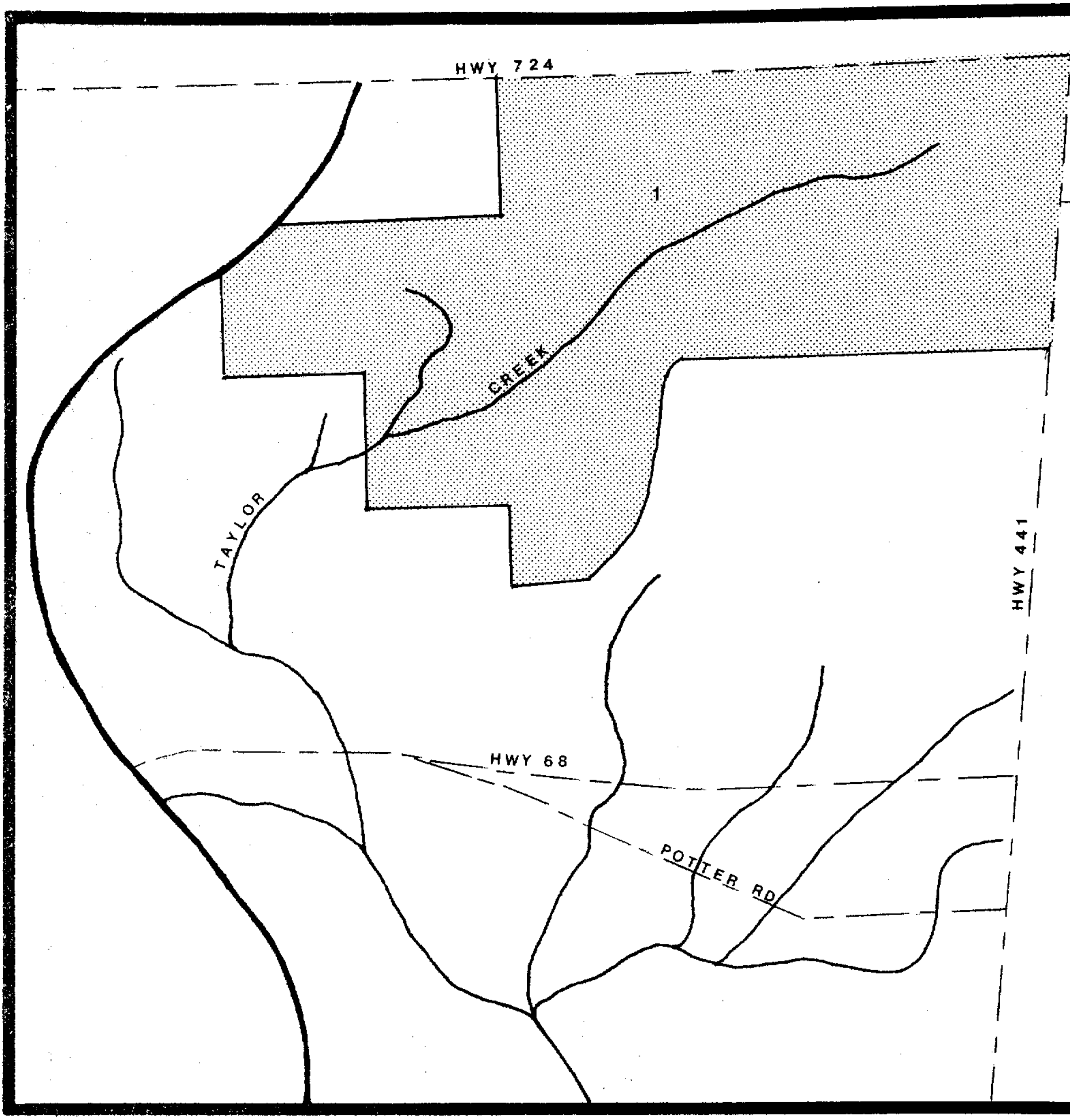
Critical Acres:
7,091

FIGURE 9. CRITICAL AREA IN NUBBIN SLOUGH SUB-WATERSHED



Critical Acres:
Henry Creek 4,255
Lettuce Creek 4,953

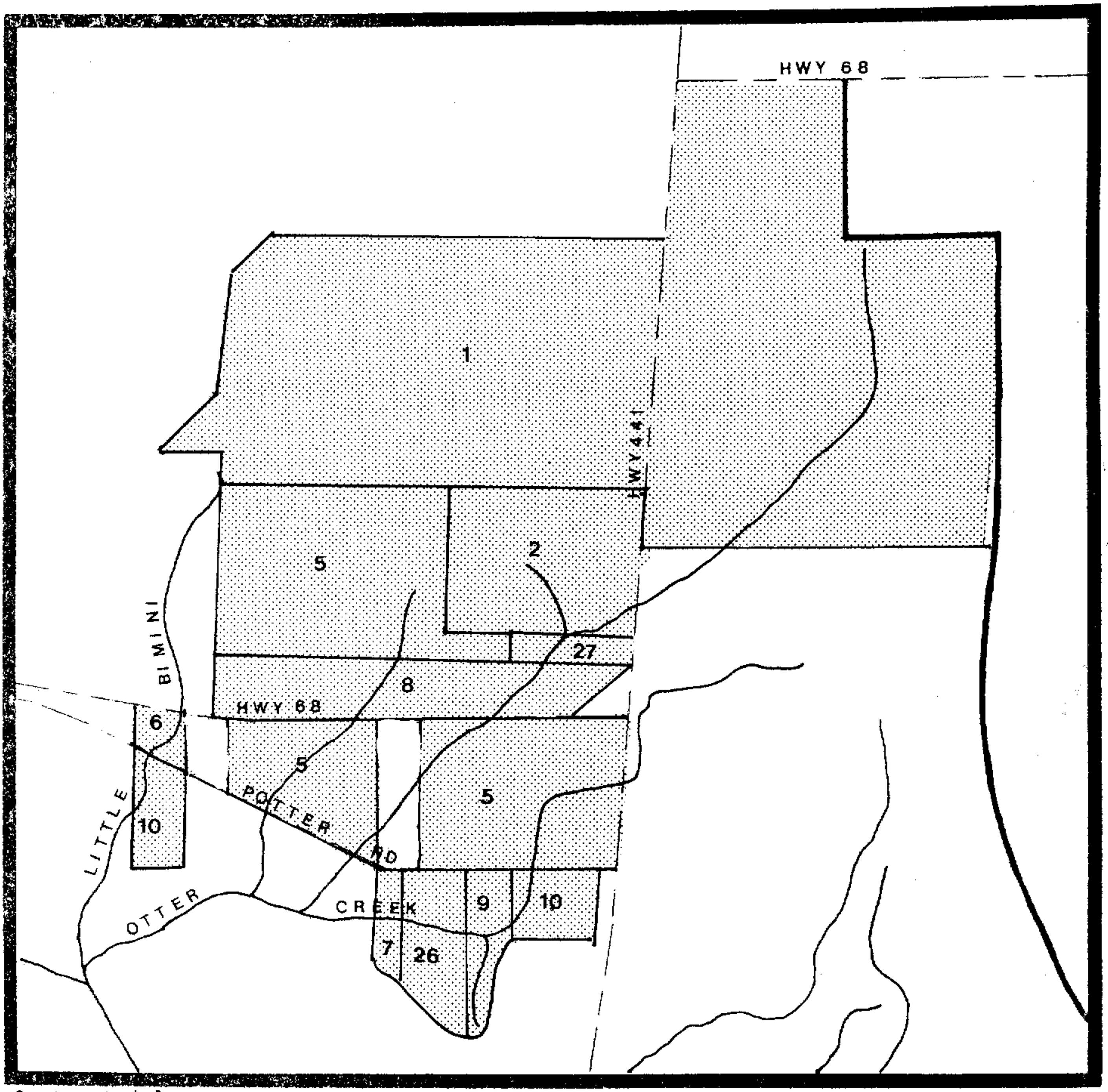
FIGURE 10. CRITICAL AREA IN HENRY CREEK AND LETTUCE CREEK SUB-WATERSHEDS



Contracted Acres:
8,032

FIGURE 11. N.W. TAYLOR CREEK SUB-WATERSHED
CRITICAL AREA CONTRACTED

Beef Cattle Contracts	Dairy Contracts
	1



Contracted Acres:
Little Bimini 3,485
Otter Creek 7,172

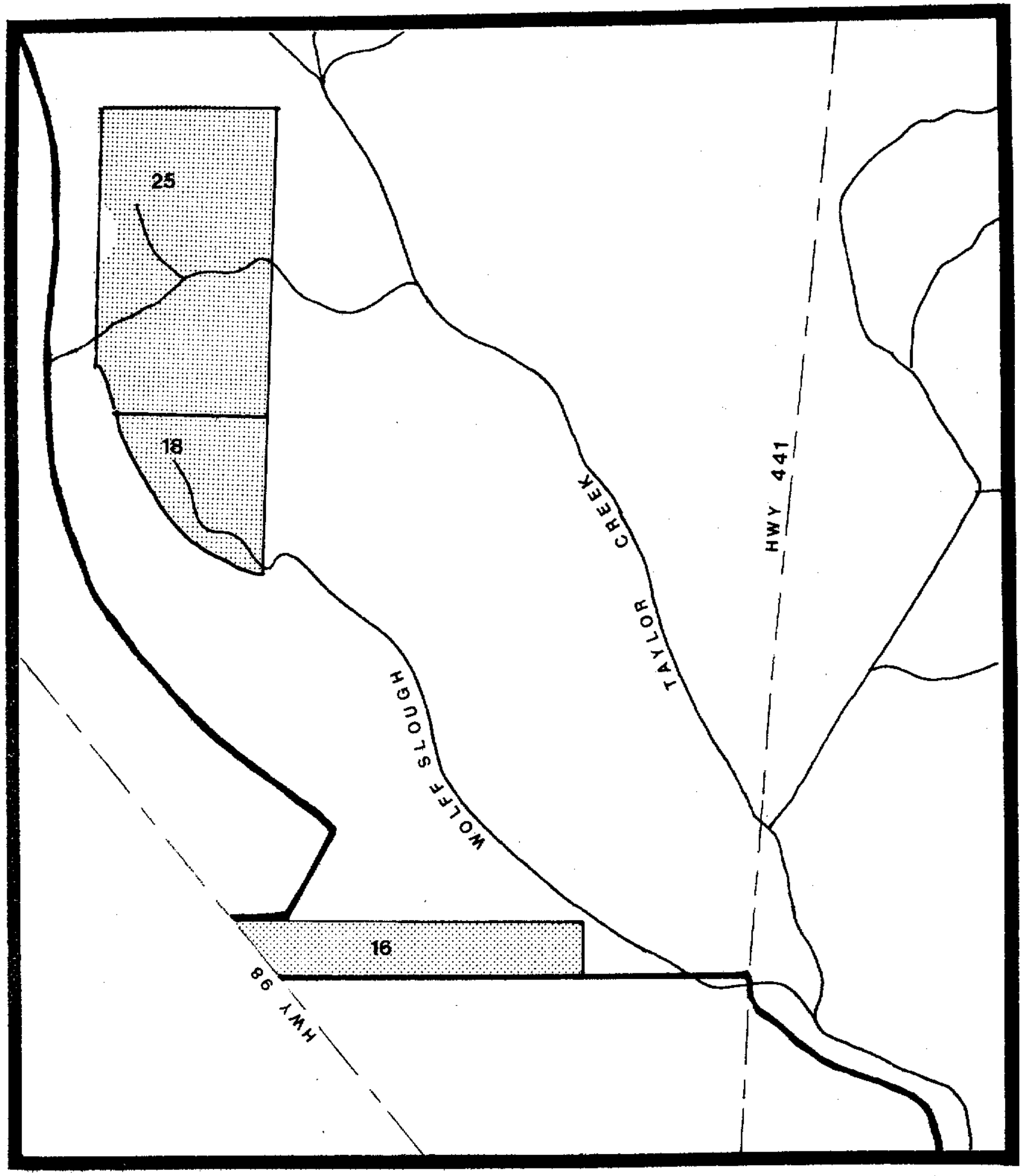
FIGURE 12. LITTLE BIMINI AND OTTER CREEK SUB-WATERSHEDS
CRITICAL AREA CONTRACTED

Beef Cattle Contracts

Otter: 7, 8, 9, 10, 26, 27
Little Bimini: 6, 8, 10

Dairy Contracts

Otter: 1, 2, 5
Little Bimini: 1, 5

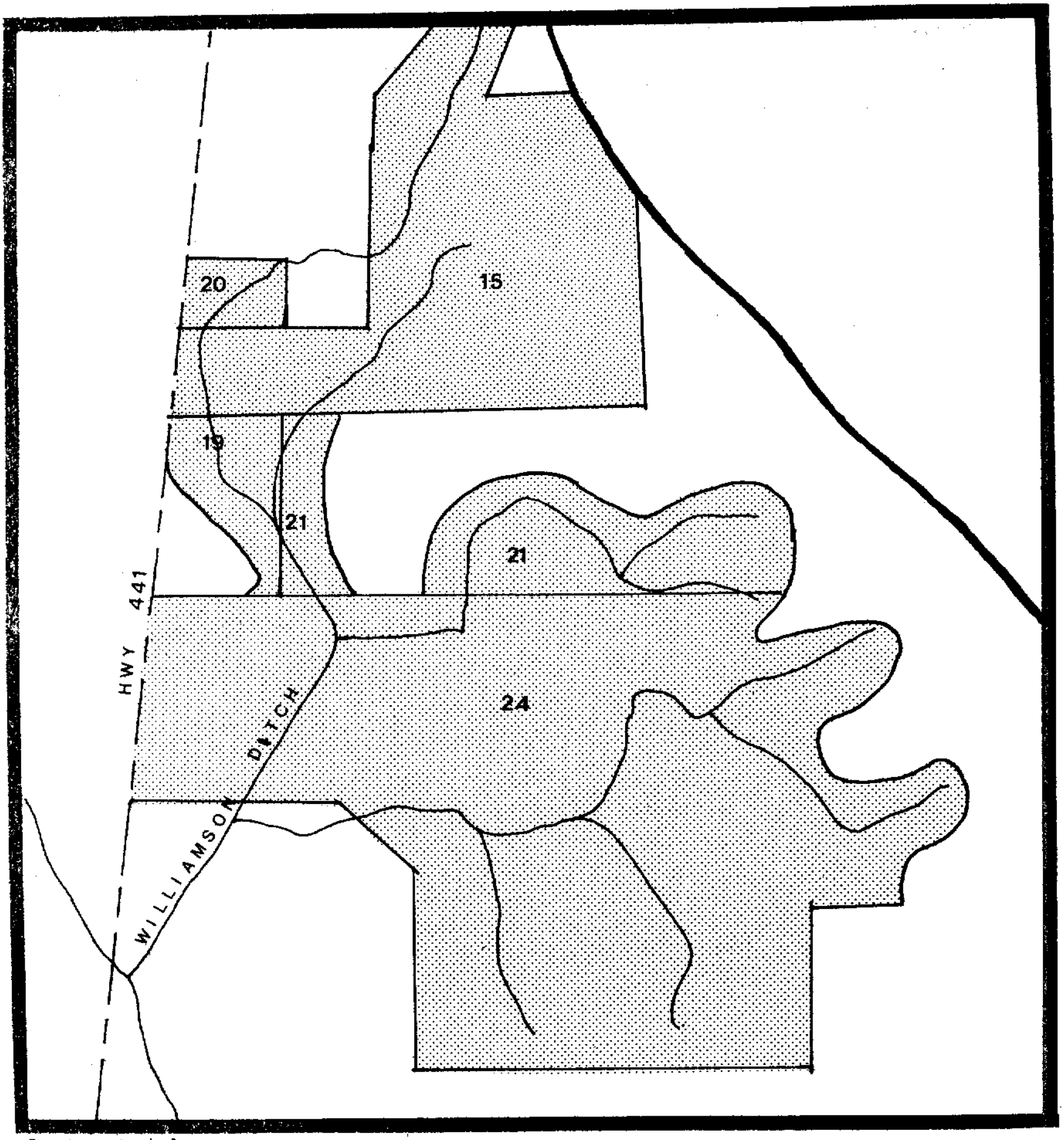


Contracted Acres:
2,765

FIGURE 13. MAIN TAYLOR CREEK SUB-WATERSHED
CRITICAL AREA CONTRACTED

Beef Cattle Contracts

Dairy Contracts
16, 18, 25



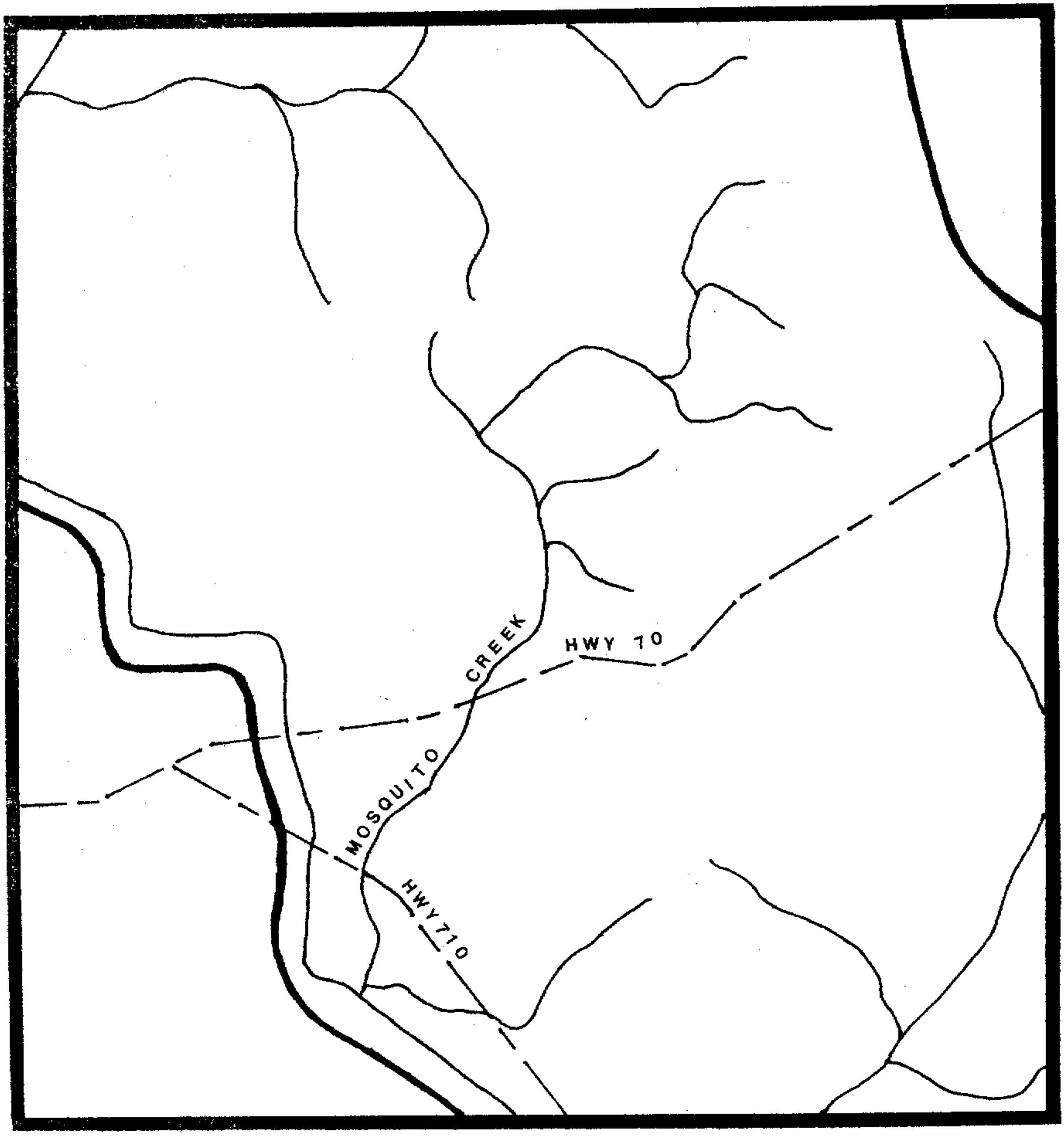
Contracted Acres:
9,689

FIGURE 14. WILLIAMSON DITCH SUB-WATERSHED
CRITICAL AREA CONTRACTED

Beef Cattle Contracts

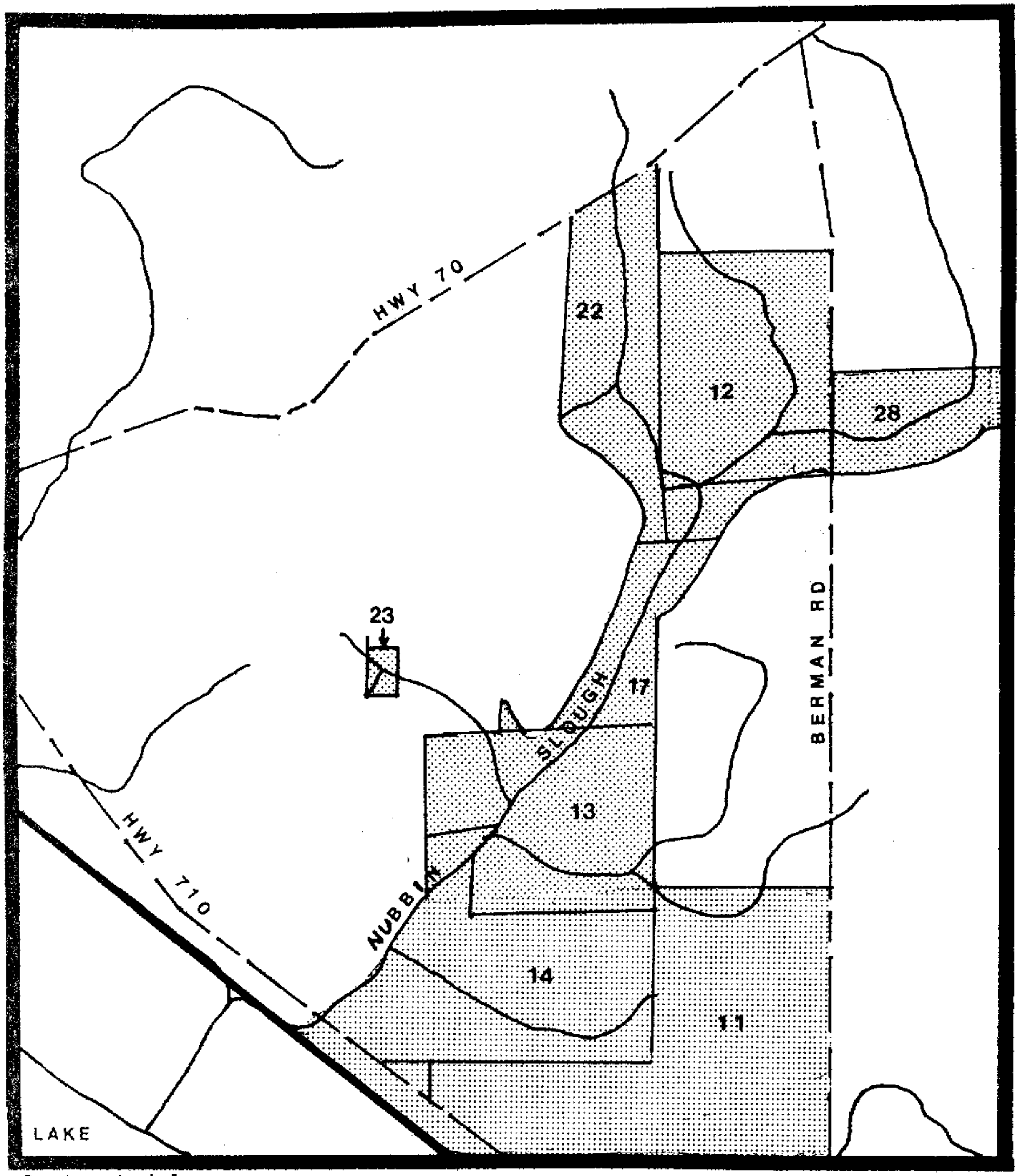
15, 19, 20, 21, 24

Dairy Contracts



Contracted Acres:
0

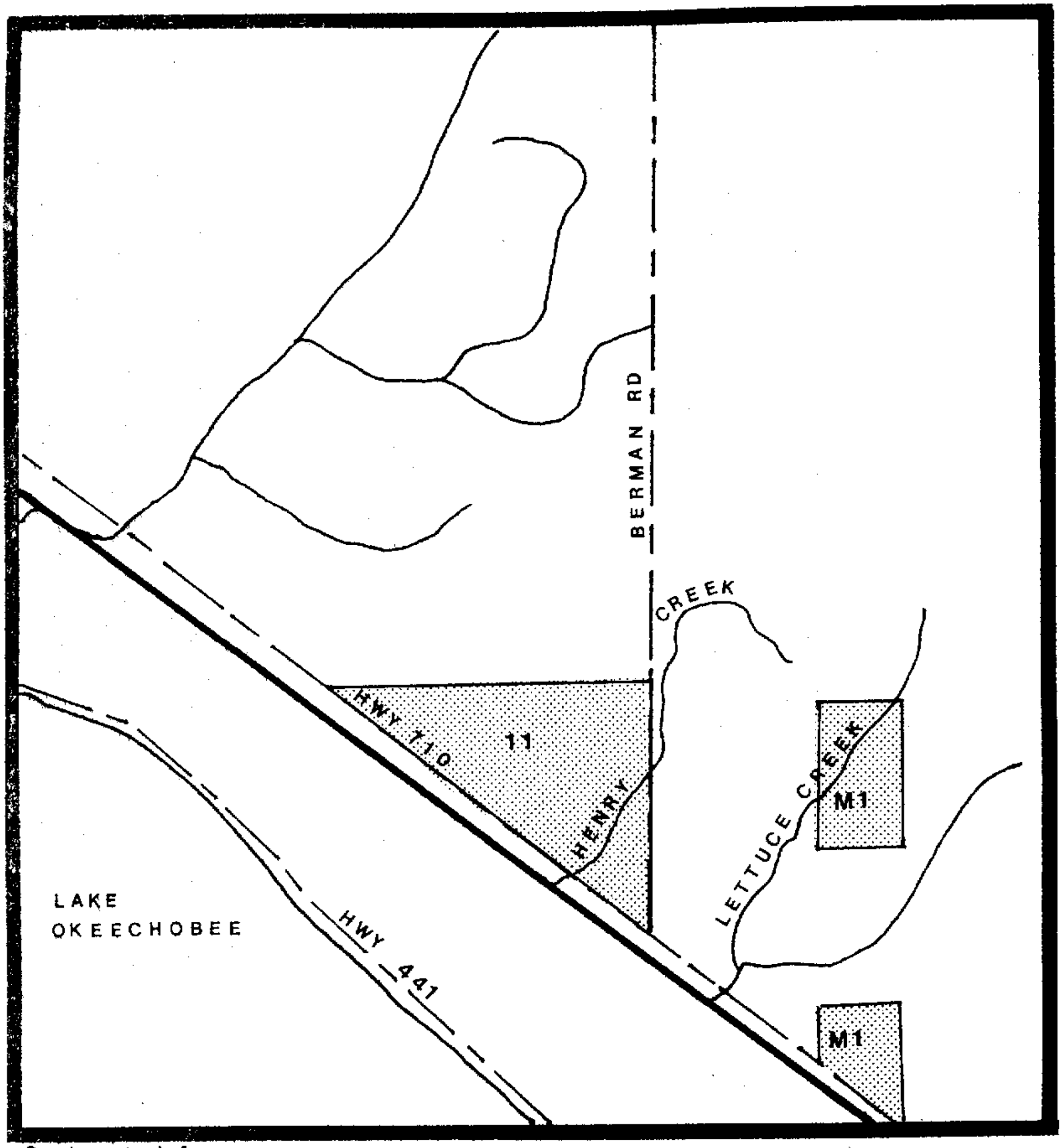
FIGURE 15. MOSQUITO CREEK SUB-WATERSHED
CRITICAL AREA CONTRACTED



Contracted Acres:
4,785

FIGURE 16. NUBBIN SLOUGH SUB-WATERSHED
CRITICAL AREA CONTRACTED

Beef Cattle Contracts	Dairy Contracts
17, 22, 23, 28	11, 12, 13, 14



Contracted Acres:
Henry Creek 2,445
Lettuce Creek 1,353

FIGURE 17. HENRY CREEK AND LETTUCE CREEK SUB-WATERSHEDS CRITICAL AREA CONTRACTED

Beef Cattle Contracts	Dairy Contracts
	11, M1

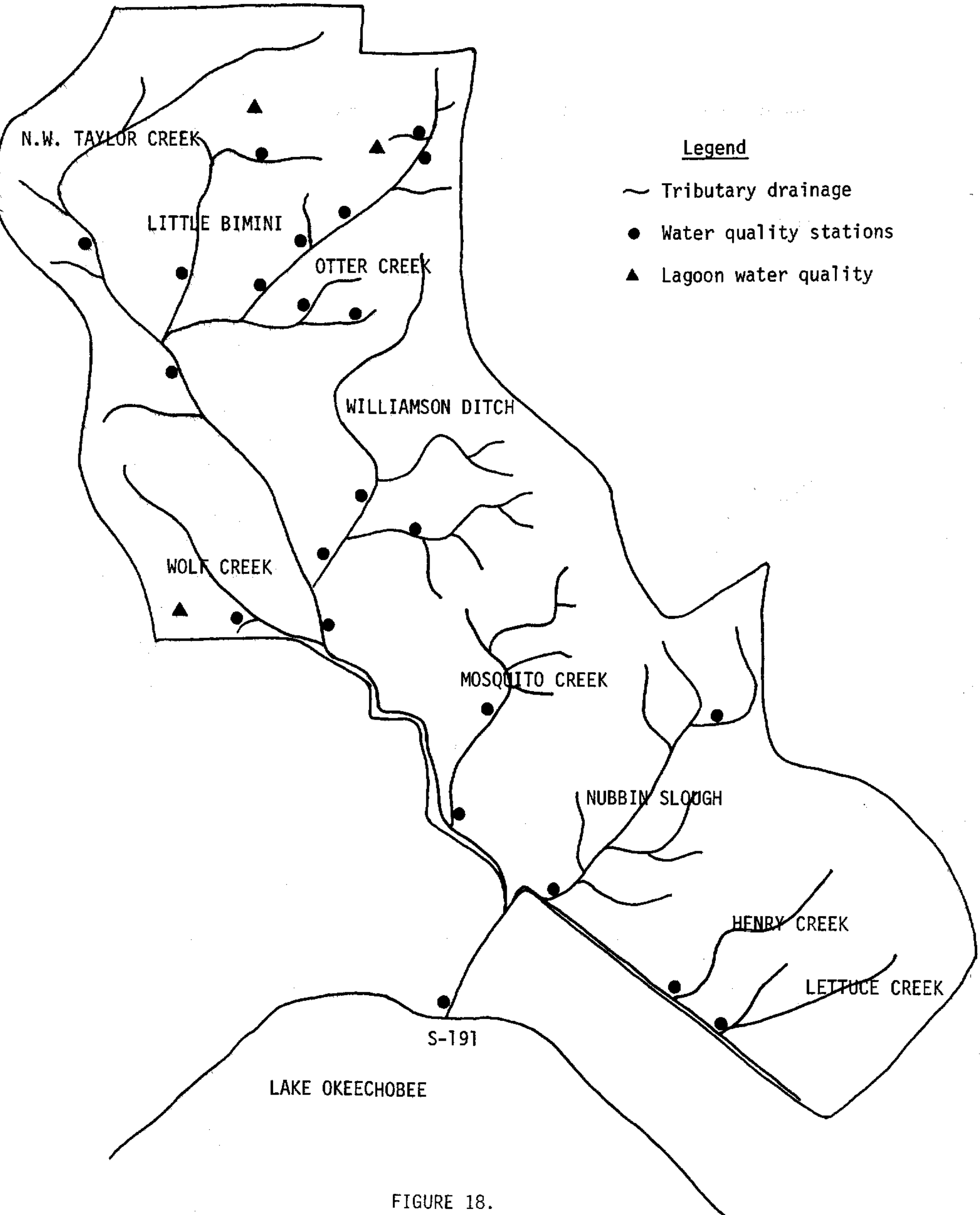


FIGURE 18.
Taylor Creek/Nubbin Slough Water Quality Stations.

FIGURE 19.
Otter Creek
Annual Nutrient Loads
1978-1983

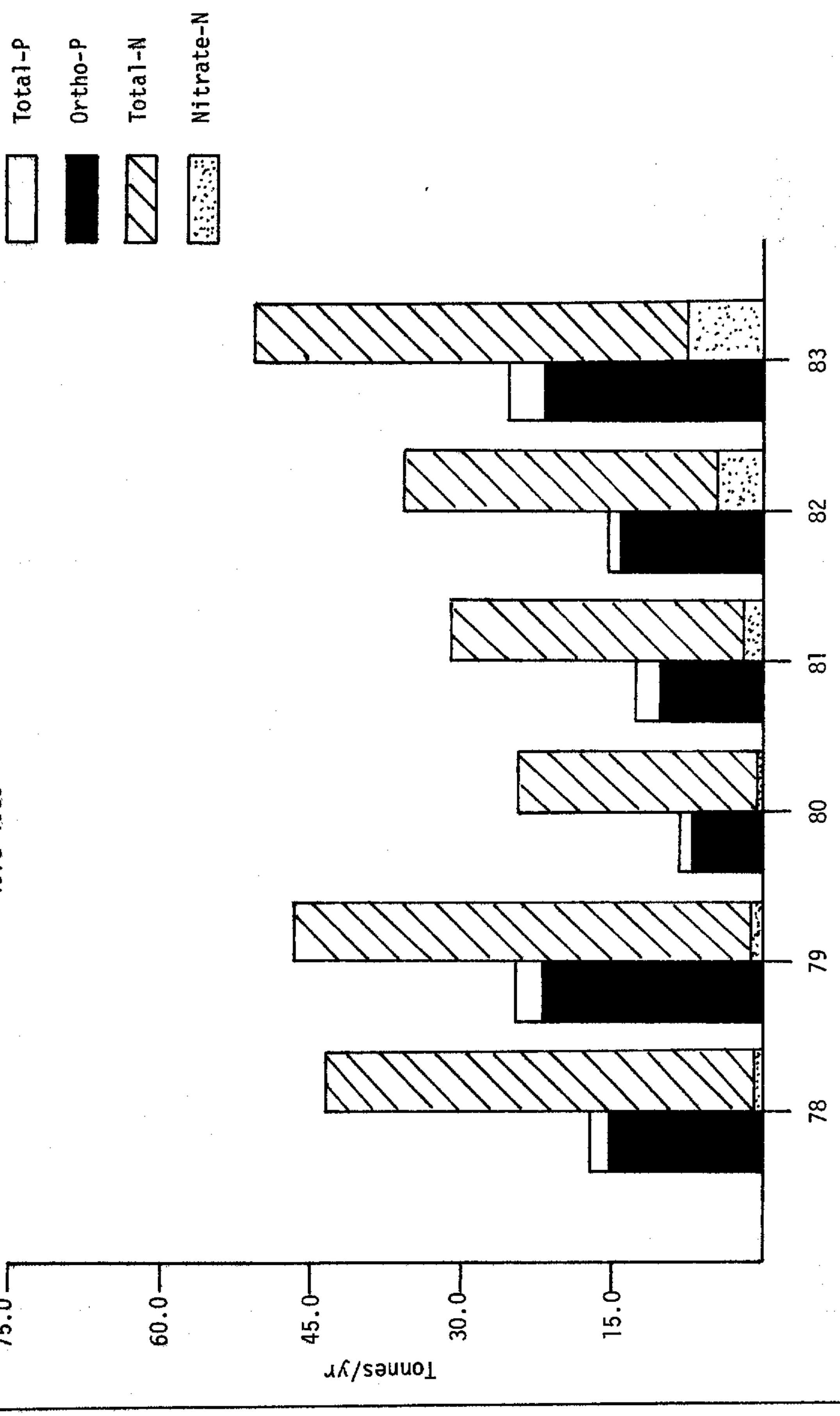


FIGURE 20.
Little Bimini
Annual Nutrient Loads
1978-1983

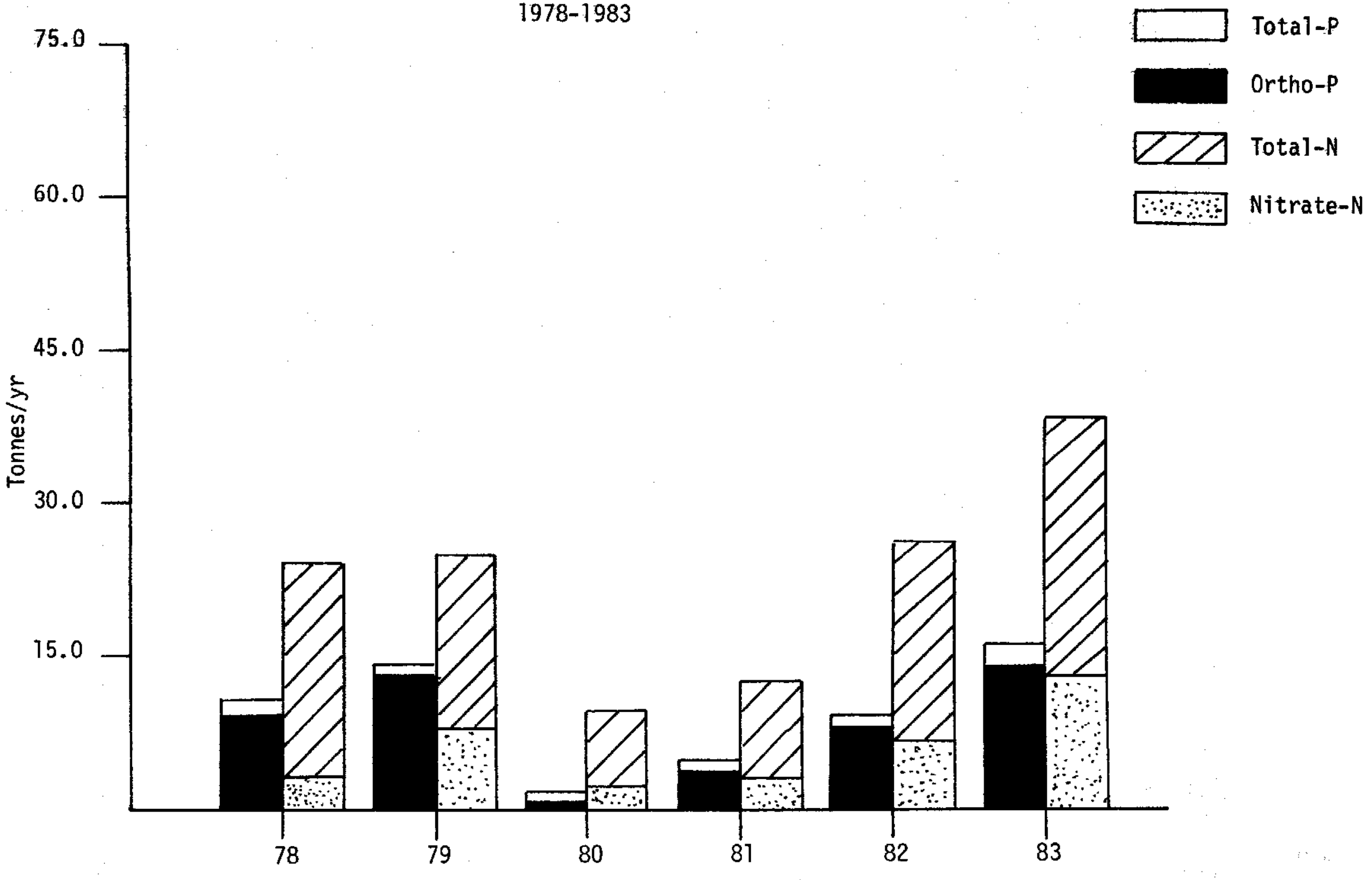


FIGURE 21.
N. W. Taylor Creek
Annual Nutrient Loads
1978-1983

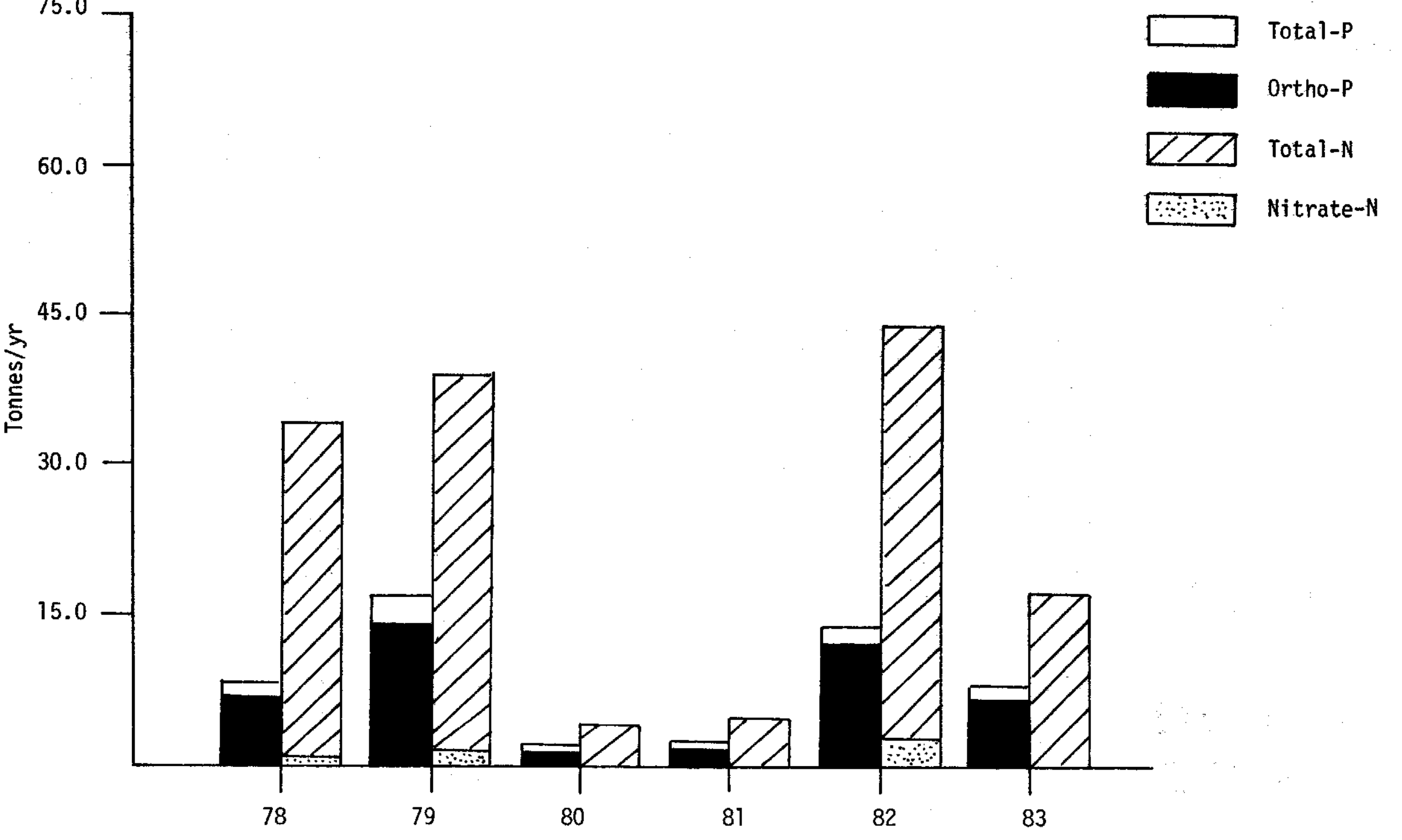


FIGURE 22.
Williamson Ditch
Annual Nutrient Loads
1978-1983

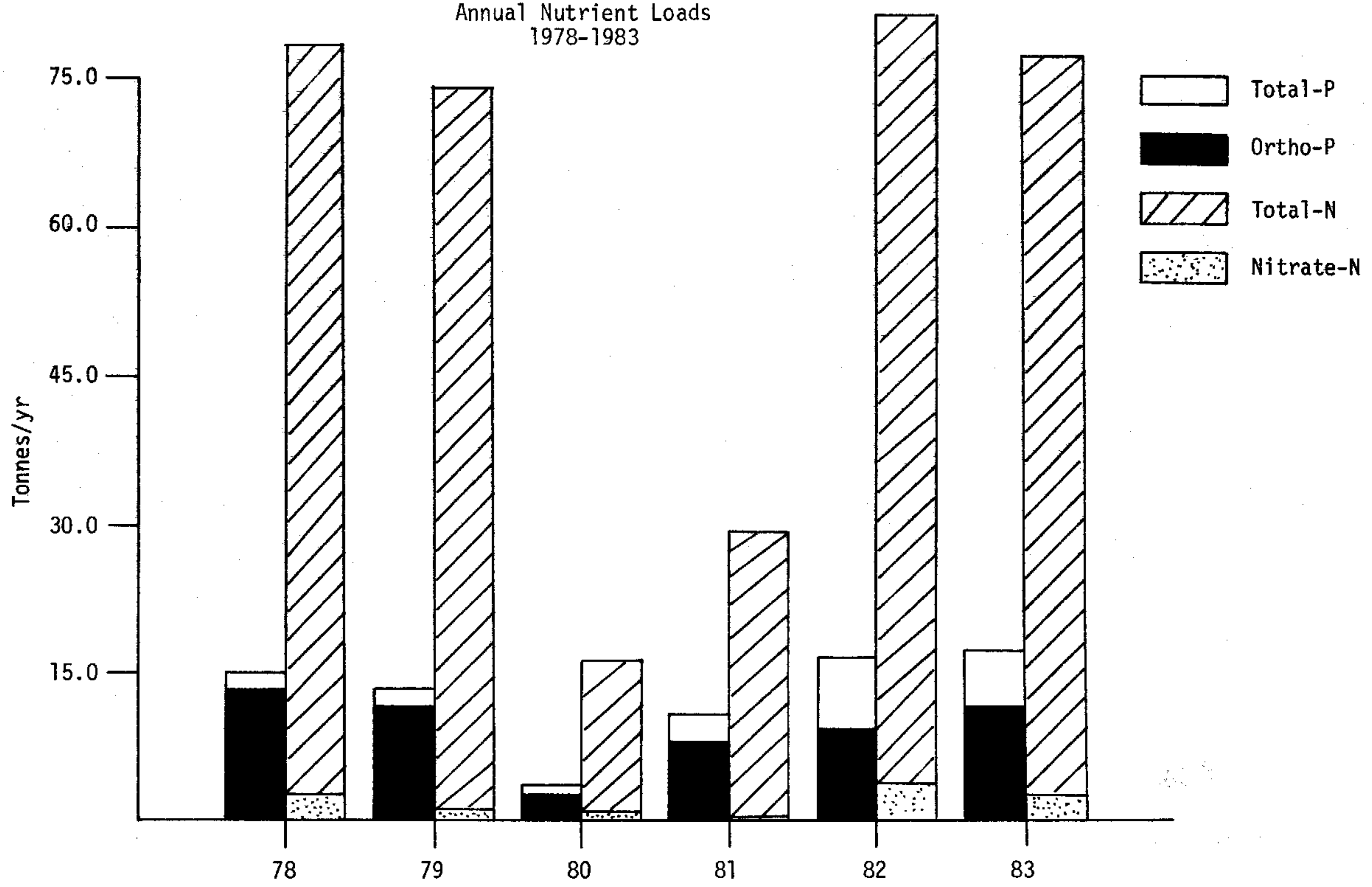


FIGURE 23.
S-191 at Lake Okeechobee
Annual Nutrient Loads
1978-1983

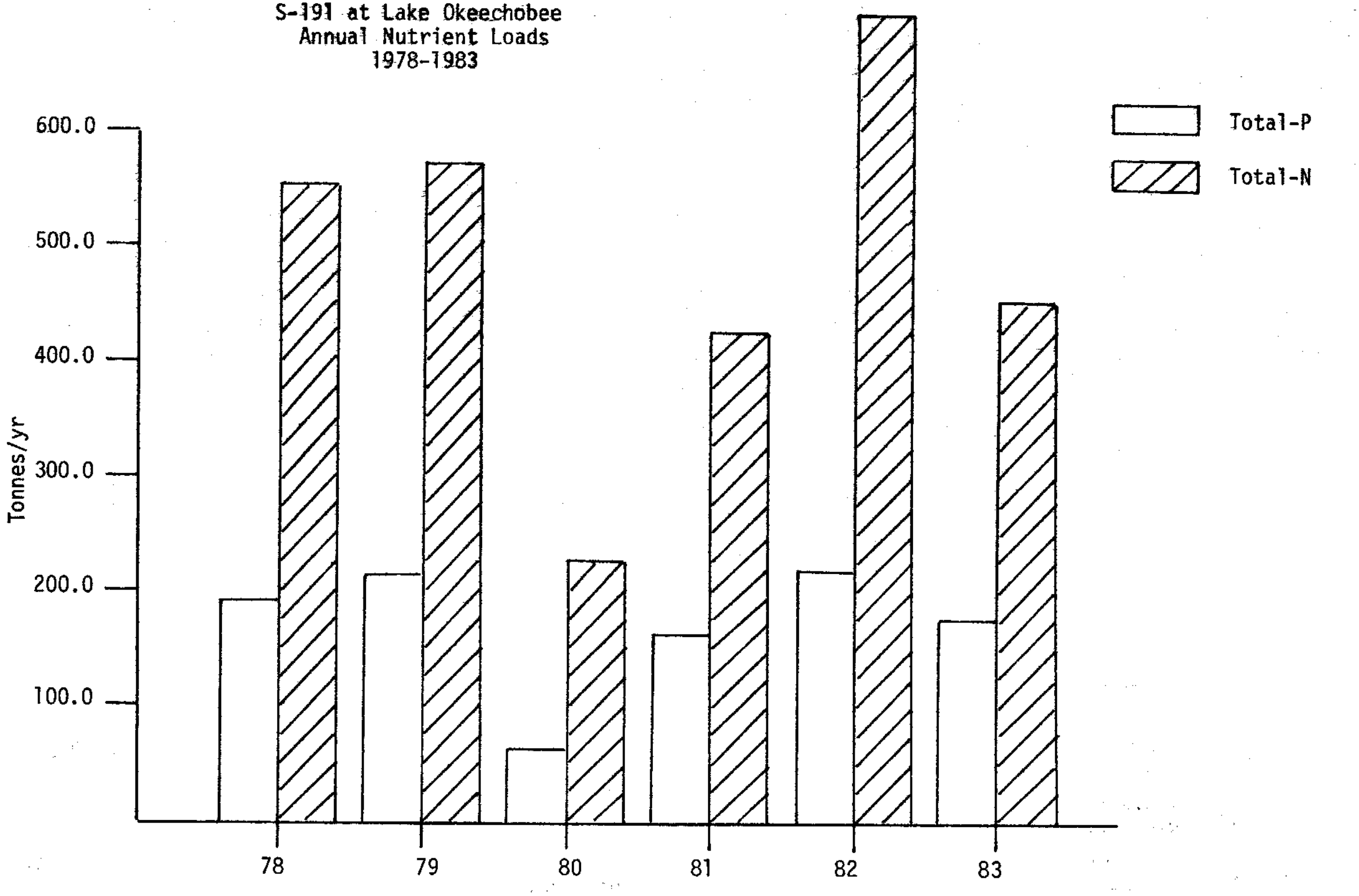


FIGURE 24.
Upper Taylor Creek
Annual Nutrient Loads
1978-1983

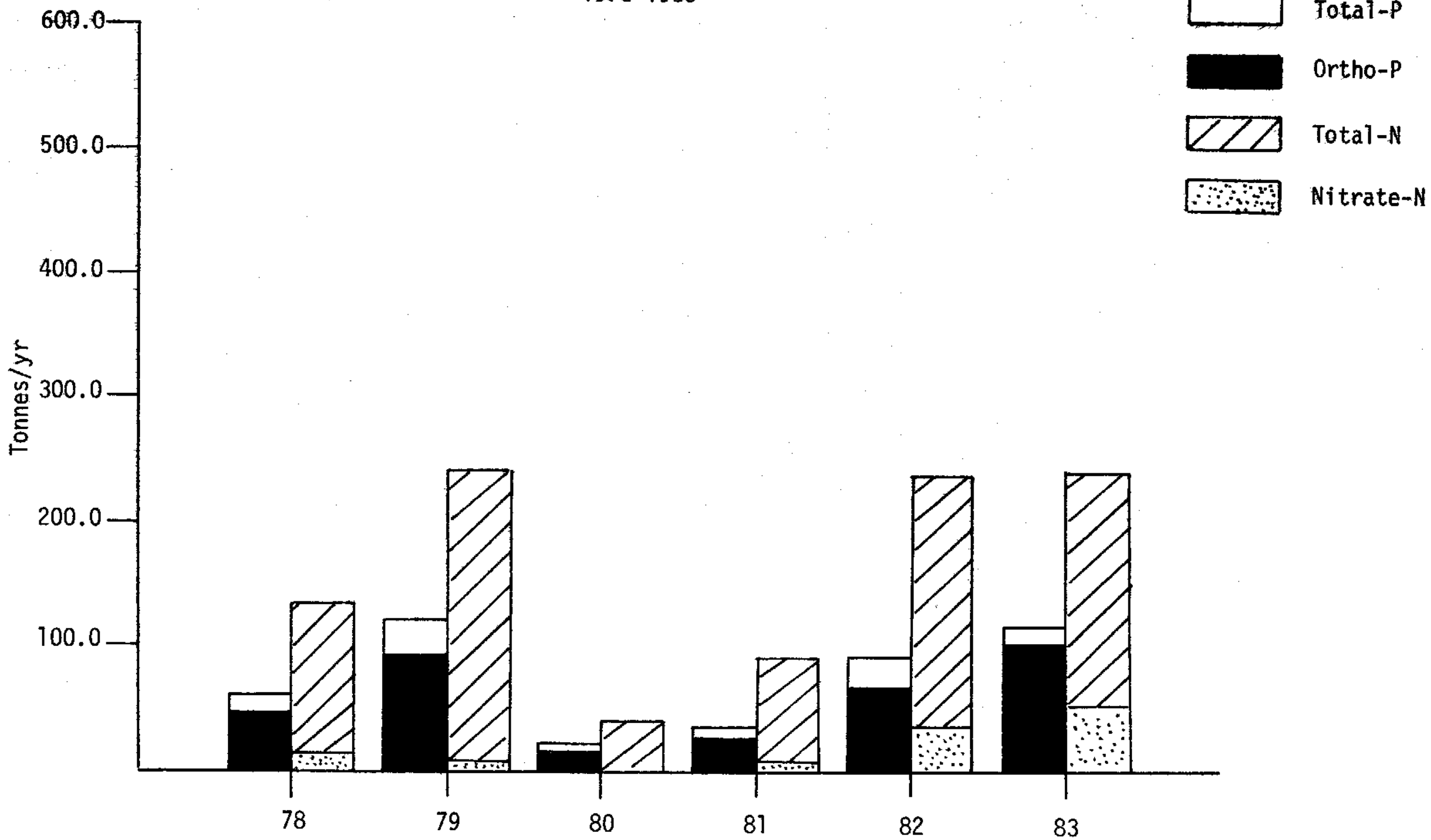


TABLE 1. NUTRIENT CONCENTRATION DATA

Showing effects of runoff from a dairy intensive area and additional effects of cattle lounging in streams. Concentrations are in milligrams per liter (mg/l), averaged over each year, with samples collected every two weeks.

NUTRIENT	SITE 1/ Otter Creek at Hwy 441	SITE 1/ Otter Creek at S.R. 68	PERCENT INCREASE (Mainly due to cattle in streams)
	1978 (January - December)		
Total P	3.2	5.3	66%
Ortho P	2.9	4.2	45%
Total N	5.6	13.6	143%
NH_4 -N	4.9	7.0	43%
NO_3 -N	0.2	0.3	50%
Cl	161	176	9%
	1979 (January - December)		
Total P	2.4	4.8	100%
Ortho P	2.3	3.8	65%
Total N	3.1	14.4	365%
NH_4 -N	1.1	4.5	309%
NO_3 -N	0.25	0.23	-8%
Cl	100	154	54%
	1980 (January - August)		
Total P	2.1	3.9	86%
Ortho P	2.0	3.3	65%
Total N	2.6	8.7	235%
NH_4 -N	0.7	3.2	357%
NO_3 -N	0.17	0.14	-18%
Cl	105	125	19%

1/ Otter Creek at S.R. 68 is about 1 mile downstream from Otter Creek at Hwy 441. Cattle (dairy animals) frequently were observed to lounge in the stream immediately upstream of Otter Creek at S.R. 68 for a distance of about ½ mile.

TABLE 2. IMPLEMENTATION OF BEST MANAGEMENT PRACTICES**

Taylor Creek-Nubbin Slough Basin

Combined

Showing acres served for each component of a BMP and by BMP

Practice		Acres Served* By Component	FY 1984 Acres Served By BMP	Cumulative Acres Served By BMP
BMP-1	Permanent Vegetative Cover		9,030	34,468
N/C	Pasture & Hayland Management	33,226		
	Proper Grazing Use	1,242		
BMP-2	Animal Waste Management System	214	102	244
	Pumping Plant	13		
	Dike			
	Waste Utilization	65		
	Waste Management System	141		
BMP-5	Diversion System			126
	Diversion	126		
BMP-6	Grazing Land Protection System		439	969
	Pond	602		
	Pipeline	347		
	Troughs	166		
	Wells	75		
BMP-8	Cropland Protection System		79	79
	Conservation Cropping System	79		
BMP-10	Stream Protection System		5,730	8,767
	Fencing	6,824		
	Livestock Crossing	2,712		
	Livestock Shade Structure	1,896		
BMP-12	Sediment Retention, Erosion or Water Control Structures			94
	Structure for Water Control	42		
	Sediment Basin	52		
BMP-13	Improving Irrigation or Water Management			10
N/C	Irrigation Water Management	10	13364	

Total acres served by installed BMP's 8,260
Total acres served by management BMP's 34,598

*For LCC Use
**On the Ground.

TABLE 3. IMPLEMENTATION OF BEST MANAGEMENT PRACTICES**

N. W. Taylor Creek

Showing acres served for each component of a BMP and by BMP by sub-watershed

Practice		*Acres Served By Component	FY 1984 Acres Served by BMP	Cumulative Acres Served By BMP
BMP-1	Permanent Vegetative Cover			6,956
	Pasture & Hayland Management	6,956		
	Proper Grazing Use			
BMP-2	Animal Waste Management System			
	Pumping Plant			
	Dike			
	Waste Utilization			
	Waste Management Systems			
BMP-5	Diversion System			
	Diversion			
BMP-6	Grazing Land Protection System			152
	Pond			
	Pipeline	152		
	Troughs			
	Well			
BMP-8	Cropland Protection System			
	Conservation Croping System			
BMP-10	Stream Protection System		2,162	2,162
	Fencing	2,162		
	Livestock Crossing			
	Livestock Shade Structure			
BMP-12	Sediment Retention, Erosion or Water Control Structures			
	Structure for Water Control			
	Sediment Basin			
BMP-13	Improving Irrigation or Water Management			
	Irrigation Water Management			

Total acres served by installed BMP's 2,010
Total acres served by management BMP's 6,956

*For LCC use.
**On the ground.

TABLE 4. IMPLEMENTATION OF BEST MANAGEMENT PRACTICES**

Little Bimini

Showing acres served for each component of a BMP and by BMP by sub-watershed

Practice		*Acres Served By Component	FY 1984 Acres Served by BMP	Cumulative Acres Served By BMP
BMP-1	Permanent Vegetative Cover			3,514
	Pasture & Hayland Management	3,514		
	Proper Grazing Use			
BMP-2	Animal Waste Management System			8
	Pumping Plant			
	Dike			
	Waste Utilization			
	Waste Management Systems	8		
BMP-5	Diversion System			
	Diversion			
BMP-6	Grazing Land Protection System			65
	Pond	65		
	Pipeline			
	Troughs			
	Well			
BMP-8	Cropland Protection System			
	Conservation Croping System			
BMP-10	Stream Protection System		304	1,047
	Fencing	1,286		
	Livestock Crossing	249		
	Livestock Shade Structure	702		
BMP-12	Sediment Retention, Erosion or Water Control Structures			
	Structure for Water Control			
	Sediment Basin			
BMP-13	Improving Irrigation or Water Management			
	Irrigation Water Management			

Total acres served by installed BMP's 1,055
Total acres served by management BMP's 3,514

*For LCC use.
**On the Ground.

TABLE 5. IMPLEMENTATION OF BEST MANAGEMENT PRACTICES**

Otter Creek

Showing acres served for each component of a BMP and by BMP by sub-watershed

Practice		*Acres Served By Component	FY 1984 Acres Served by BMP	Cumulative Acres Served By BMP
BMP-1	Permanent Vegetative Cover			7,121
	Pasture & Hayland Management	7,111		
	Proper Grazing Use	10		
BMP-2	Animal Waste Management System	120		40
	Pumping Plant			
	Dike			
	Waste Utilization			
	Waste Management Systems	39		
BMP-5	Diversion System			104
	Diversion	104		
BMP-6	Grazing Land Protection System			423
	Pond	303		
	Pipeline	120		
	Troughs	111		
	Well			
BMP-8	Cropland Protection System			41
	Conservation Croping System	41		
BMP-10	Stream Protection System		1,920	2,433
	Fencing	1,607		
	Livestock Crossing	1,046		
	Livestock Shade Structure	877		
BMP-12	Sediment Retention, Erosion or Water Control Structures			
	Structure for Water Control			
	Sediment Basin			
BMP-13	Improving Irrigation or Water Management			10
	Irrigation Water Management	10		

Total acres served by installed BMP's 2,744
Total acres served by management BMP's 7,172

*For LCC use.
**On the Ground.

TABLE 6. IMPLEMENTATION OF BEST MANAGEMENT PRACTICES**

Main Taylor Creek

Showing acres served for each component of a BMP and by BMP by sub-watershed

Practice		*Acres Served By Component	FY 1984 Acres Served by BMP	Cumulative Acres Served By BMP
BMP-1	Permanent Vegetative Cover		675	1,426
	Pasture & Hayland Management	1,426		
	Proper Grazing Use			
BMP-2	Animal Waste Management System	94	94	94
	Pumping Plant			
	Dike			
	Waste Utilization			
	Waste Management Systems			
BMP-5	Diversion System			
	Diversion			
BMP-6	Grazing Land Protection System			
	Pond			
	Pipeline			
	Troughs			
	Well			
BMP-8	Cropland Protection System			
	Conservation Croping System			
BMP-10	Stream Protection System			438
	Fencing	468		
	Livestock Crossing	402		
	Livestock Shade Structure			
BMP-12	Sediment Retention, Erosion or Water Control Structures			52
	Structure for Water Control			
	Sediment Basin	52		
BMP-13	Improving Irrigation or Water Management			
	Irrigation Water Management			

Total acres served by installed BMP's 584
Total acres served by management BMP's 1,426

*For LCC use.
**On the Ground.

TABLE 7. IMPLEMENTATION OF BEST MANAGEMENT PRACTICES**

Williamson Ditch

Showing acres served for each component of a BMP and by BMP by sub-watershed

Practice		*Acres Served By Component	FY 1984 Acres Served by BMP	Cumulative Acres Served By BMP
BMP-1	Permanent Vegetative Cover		5,911	8,431
	Pasture & Hayland Management	7,243		
	Proper Grazing Use	1,188		
BMP-2	Animal Waste Management System			
	Pumping Plant			
	Dike			
	Waste Utilization			
	Waste Management Systems			
BMP-5	Diversion System			
	Diversion			
BMP-6	Grazing Land Protection System		350	240
	Pond	145		
	Pipeline	75		
	Troughs	55		
	Well	75		
BMP-8	Cropland Protection System			
	Conservation Croping System			
BMP-10	Stream Protection System		946	636
	Fencing	546		
	Livestock Crossing	400		
	Livestock Shade Structure			
BMP-12	Sediment Retention, Erosion or Water Control Structures			
	Structure for Water Control			
	Sediment Basin			
BMP-13	Improving Irrigation or Water Management			
	Irrigation Water Management			

Total acres served by installed BMP's 636
Total acres served by management BMP's 8,431

*For LCC use.
**On the Ground.

TABLE 8. IMPLEMENTATION OF BEST MANAGEMENT PRACTICES**

Nubbin Slough

Showing acres served for each component of a BMP and by BMP by sub-watershed

Practice		*Acres Served By Component	FY 1984 Acres Served by BMP	Cumulative Acres Served By BMP
BMP-1	Permanent Vegetative Cover		1,059	3,850
	Pasture & Hayland Management	3,850		
	Proper Grazing Use			
BMP-2	Animal Waste Management System			102
	Pumping Plant	13		
	Dike			
	Waste Utilization	65		
	Waste Management Systems	94		
BMP-5	Diversion System			22
	Diversion	22		
BMP-6	Grazing Land Protection System		89	89
	Pond	89		
	Pipeline			
	Troughs			
	Well			
BMP-8	Cropland Protection System			
	Conservation Croping System			
BMP-10	Stream Protection System		319	715
	Fencing	523		
	Livestock Crossing	319		
	Livestock Shade Structure	195		
BMP-12	Sediment Retention, Erosion or Water Control Structures			42
	Structure for Water Control	42		
	Sediment Basin			
BMP-13	Improving Irrigation or Water Management			
	Irrigation Water Management			

Total acres served by installed BMP's 864
Total acres served by management BMP's 3,850

*For LCC use.
**On the Ground.

TABLE 9. IMPLEMENTATION OF BEST MANAGEMENT PRACTICES**

Henry Creek

Showing acres served for each component of a BMP and by BMP by sub-watershed

Practice		*Acres Served By Component	FY 1984 Acres Served by BMP	Cumulative Acres Served By BMP
BMP-1	Permanent Vegetative Cover			1,817
	Pasture & Hayland Management	1,773		
	Proper Grazing Use	44		
BMP-2	Animal Waste Management System			
	Pumping Plant			
	Dike			
	Waste Utilization			
	Waste Management Systems			
BMP-5	Diversion System			
	Diversion			
BMP-6	Grazing Land Protection System			
	Pond			
	Pipeline			
	Troughs			
	Well			
BMP-8	Cropland Protection System		79	79
	Conservation Croping System	79		
BMP-10	Stream Protection System			367
	Fencing	232		
	Livestock Crossing	296		
	Livestock Shade Structure	122		
BMP-12	Sediment Retention, Erosion or Water Control Structures			
	Structure for Water Control			
	Sediment Basin			
BMP-13	Improving Irrigation or Water Management			
	Irrigation Water Management			

Total acres served by installed BMP's 367
Total acres served by management BMP's 1,896

*For LCC use.
**On the Ground.

TABLE 10. IMPLEMENTATION OF BEST MANAGEMENT PRACTICES**

Lettuce Creek

Showing acres served for each component of a BMP and by BMP by sub-watershed

Practice		*Acres Served By Component	FY 1984 Acres Served by BMP	Cumulative Acres Served By BMP
BMP-1	Permanent Vegetative Cover		1,353	1,353
	Pasture & Hayland Management	1,353		
	Proper Grazing Use			
BMP-2	Animal Waste Management System			
	Pumping Plant			
	Dike			
	Waste Utilization			
	Waste Management Systems			
BMP-5	Diversion System			
	Diversion			
BMP-6	Grazing Land Protection System			
	Pond			
	Pipeline			
	Troughs			
	Well			
BMP-8	Cropland Protection System			
	Conservation Croping System			
BMP-10	Stream Protection System			
	Fencing			
	Livestock Crossing			
	Livestock Shade Structure			
BMP-12	Sediment Retention, Erosion or Water Control Structures			
	Structure for Water Control			
	Sediment Basin			
BMP-13	Improving Irrigation or Water Management			
	Irrigation Water Management			

Total acres served by installed BMP's 0
Total acres served by management BMP's 1,353

*For LCC use.
**On the Ground.

TABLE 11. FUNDS BY SUB-WATERSHED BY PRACTICE

Page 1 of 2

Sub-watershed BMP	Contract Obligation	Practices on the Ground: Cost-shares Earned	Total Cost of BMP's	State Funds	Farmers Share
N.W. Taylor Creek					
BMP-10	$ 26,099	$ 10,014	$ 29,286	$17,003	$ 2,269
Otter Creek					
BMP-2	6,891		24,718	16,060	8,658
BMP-5			350		350
BMP-6	17,458	8,212	13,399	5,186	1
BMP-10	113,507	68,931	133,443	62,331	2,181
BMP-12			2,587	2,587	
Little Bimini					
BMP-2			6,230		6,230
BMP-6	6,672	2,866	4,230	955	409
BMP-8			608		608
BMP-10	55,381	37,425	65,209	17,634	10,150
Main Taylor Creek					
BMP-2	3,547	3,450	4,654	141	1,063
BMP-6	6,698				
BMP-10	23,145	12,044	16,159	2,733	1,382
BMP-12	6,378	6,378	8,504	2,126	

TABLE 11. FUNDS BY SUB-WATERSHED BY PRACTICE

Page 2 of 2

Sub-watershed BMP	Contract Obligation	Practices on the Ground: Cost-shares Earned	Total Cost of BMP's	State Funds	Farmers Share
Williamson Ditch					
BMP-6	$ 9,774	$ 5,087	$ 6,820	$ 490	$ 1,243
BMP-10	89,257	37,605	51,710	8,463	5,642
Nubbin Slough					
BMP-2	29,396	16,235	21,806		5,571
BMP-5	646	643	1,678		1,035
BMP-6	8,637				
BMP-10	135,973	36,390	51,454	2,500	12,564
BMP-12	3,946	496	1,491		995
Henry Creek					
BMP-6	588				
BMP-10	41,202	17,545	24,020	1,447	5,028
Lettuce Creek					
BMP-2	21,265				
BMP-6	4,857				
BMP-10	19,686				
BMP-12	3,735				

TABLE 12.

CRITICAL ACRES AND FARMS BY SUB-WATERSHED

Sub-watershed	Acres Total	Acres Contracted	Acres % Contracted	Farms Total	Farms Contracted
N. W. Taylor Creek	11,865	8,032	68%	3	1
Little Bimini	3,853	3,485	98%	9	8
Otter Creek	10,753	7,172	67%	11	8
Main Taylor Creek	6,464	2,765	43%	9	3
Williamson Ditch	9,774	9,689	99%	6	5
Mosquito Creek	4,101	0		4	0
Nubbin Slough	7,091	4,785	57%	11	7
Henry Creek	4,255	2,445	57%	3	1
Lettuce Creek	4,953	1,353	38%	5	1

TABLE 13.

Taylor Creek/Nubbin Slough Open Channel, Runoff, and Lagoon Sampling Sites.

PERIOD OF RECORD	SITE #	SAMPLE LABEL	LOCATION
01/04/72 to Present	1	TCHW 01	N.W. Taylor Creek at HWY 68
03/19/74 to Present	2	TCHW 02	Little Bimini at Potter Road
01/04/72 to Present	3	TCHW 03	Otter Creek at S-13B & HWY 441
03/19/74 to Present	6	TCHW 06	Otter Creek at Potter Rd (S-13)
09/05/79 to Present	18	TCHW 18	Taylor Creek at S-2
09/05/79 to Present	19	TCHW 19	East Otter Creek at Potter Road
09/05/79 to Present	20	TCHW 20	East Otter Creek at HWY 441
09/05/79 to Present	23	TCHW 23	Wilson Rucks Dairy Runoff
09/05/79 to Present	25	TCHW 25	McArthur #1 2nd Stage Lagoon Runoff
09/05/79 to Present	26[1]	TCHW 26	Otter Creek at McArthur Farms
10/28/81 to Present	32	TCHW 32	McArthur Farms Dairy Barn #1 Lagoon
10/28/81 to Present	34	TCHW 34	SEZ Dairy Lagoon
11/20/83 to Present	41	TCHW 41	McArthur Farms Dairy Barn #5 Lagoon
01/04/72 to Present	7	ARS 07	Williamson Main Ditch
01/04/72 to Present	8	ARS 08	Williamson East Lateral
01/04/72 to Present	9	ARS 09	Williamson Ditch at S-7
03/19/74 to Present	11	ARS 11	Taylor Creek at Cemetery Road
03/19/74 to Present	13	ARS 13	Mosquito Creek at HWY 710
03/19/74 to Present	14	ARS 14	Nubbin Slough at HWY 710
03/19/74 to Present	15	ARS 15	Mosquito Creek at HWY 70
11/01/77 to Present	17	ARS 17	Nubbin Slough at Berman Road
06/11/81 to present	39	ARS 39	Henry Creek at HWY 710
06/11/81 to Present	40	ARS 40	Lettuce Creek at HWY 710
01/01/83 to Present	104	TCNS 104	McArthur Farms Runoff at Little Bimini
01/01/78 to Present	1	OSEZ 1	SEZ Dairy, Wolf Creek outflow
01/01/72 to Present	S191	S191	Structure S-191 at Lake Okeechobee

[1]Water quality site actual period of record 09/05/79 to 09/03/81; continued on 10/18/82 to Present.

TABLE 14.

Taylor Creek/Nubbin Slough Discontinued Sampling Sites.

PERIOD OF RECORD	SITE #	SAMPLE LABEL	LOCATION
01/04/72 to 09/11/84	4	TCHW 04	Otter Creek at HWY 68
03/19/74 to 09/03/81	5	TCHW 05	Otter Creek at Otter Creek Road
09/05/79 to 09/03/81	21	TCHW 21	Little Bimini at HWY 68
09/05/79 to 09/24/80	22	TCHW 22	F & R Dairy Runoff
09/05/79 to 09/27/83	24	TCHW 24	Remsberg North Runoff
09/05/79 to 10/26/83	27	TCHW 27	McArthur Hayfield Runoff
09/05/79 to 09/03/81	28	TCHW 28	Otter Creek Upstream
11/19/80 to 10/25/83	29	TCHW 29	Gomez Creek at N. HWY 68 West
11/19/80 to 10/25/83	30	TCHW 30	Gomez Creek at N. HWY 68 East
10/01/81 to 09/11/84	31	TCHW 31	McArthur Runoff at Otter Creek
11/17/82 to 09/14/83	35	TCHW 35	Little Bimini below Raulerson's
03/01/76 to 09/31/81	S-13[1]	TCHW 508	Otter Creek at Potter Road
03/01/76 to 09/31/81	S-13B[1]	TCHW 509	Otter Creek at HWY 441
01/04/72 to 09/03/81	10	ARS 10	Taylor Creek at HWY 441
01/04/72 to 09/10/84	12	ARS 12	Taylor Creek at Well Line B
11/01/77 to 10/25/83	16	ARS 16	Nubbin Slough at HWY 70
10/18/82	36[2]	ARS 36	Newcomer Dairy N. Runoff to Nubbin Slough
10/18/82	38[2]	ARS 38	Newcomer Dairy S. Runoff to Nubbin Slough
10/28/81 to 11/29/83	33	TCHW 33	T. Rucks Dairy Lagoon at Rucks Rd.
10/18/82	37[2]	ARS 37	New Palm Dairy

[1]Automatic sampler sites; not in use at this time.
[2]Only one water quality sample taken during period of record.

TABLE 15.

Comparison of 1983 Rainfall to Period of Record Rainfall (centimeters).

	Period of Record (1955-1982)	1983	% of Period of Record
January	4.52[1]	7.54[3]	167
February	5.54	24.61	444
March	7.52	9.63	128
April	4.78	4.45	93
May	12.45	3.25	26
June	20.22	20.98	104
July	16.81	14.43	86
August	17.02	19.71	116
September	16.33	11.07	68
October	8.48	17.86	211
November	4.01	2.79	69
December	4.14	11.25	272
	127.03[2]	147.57[4]	116

Rainfall quantities are Thiessen-weighted averages for the eight rainfall stations located throughout the upper Taylor Creek watershed.

[1]Average monthly for period of record.

[2]Average annual for period of record.

[3]Total monthly for 1983.

[4]Total annual for 1983.

TABLE 16.

Adjusted Hydrologic Land Areas for the Major Subwatershed in the Lower Nubbin Slough Basin.

	1982 Watershed Boundaries	1983 Adjusted Watershed Boundaries
Mosquito Creek	4,919	5,182
Nubbin Slough	5,466	4,818
Henry Creek	1,842	4,057
Lettuce Creek	9,109	6,559
Remainder	392	1,141
Lower Nubbin Slough	21,728	21,757

TABLE 17. Annual Ortho and Total Phosphorus Loads, Loads Per Unit Land Area, Percent Total Load, and Total Land Areas for the Taylor Creek/Nubbin Slough Watershed and Major Subwatersheds for 1983.

	Land Area (ha)	O-PO4 Load (kg)	O-PO4 Load/Unit Land Area (kg/ha)	O-PO4 Percent Total Load	T-PO4 Load (kg)	T-PO4 Load/Unit Land Area (kg/ha)	T-PO4 Percent Total Load
Otter Creek	2,884	21,947	7.61	14.6	25,222	8.75	14.38
Little Bimini[1]	1,528	14,866	9.73	9.86	16,134	10.56	9.20
N.W. Taylor Creek	4,938	6,690	1.35	4.44	8,189	1.66	4.67
Williamson Ditch	8,509	11,485	1.35	7.62	17,066	2.01	9.73
Upper Taylor Creek[1]	27,060	75,833	2.08	50.31	86,205	3.19	49.17
Mosquito Creek[2]	5,182	~~344,875~~	~~66.55~~	~~228.84~~	~~364,817~~	~~70.40~~	~~208.01~~
Nubbin Slough[2]	4,818	~~323,479~~	~~67.14~~	~~214.65~~	~~431,712~~	~~89.60~~	~~246.15~~
Henry Creek[2]	4,057	~~228,344~~	~~56.28~~	~~151.52~~	~~562,170~~	~~137.96~~	~~320.53~~
Lettuce Creek[2]	6,559	~~135,364~~	~~20.64~~	~~89.82~~	~~185,917~~	~~28.35~~	~~106.00~~
TC/NS Total (S-191)[1]	48,788	150,703	3.09	100.00	175,387	3.59	100.0

[1]Loads estimated
[2]Period of record 06/01/83 through 12/31/83

TABLE 18. Annual Nitrate and Total Nitrogen Loads, Loads Per Unit Land Area, Percent Total Load, and Total Land Areas for the Taylor Creek/Nubbin Slough Watershed and Major Subwatersheds for 1983.

	Land Area (ha)	NO3 Load (kg)	NO3 Load/Unit Land Area (kg/ha)	NO3 Percent Total Load	Total N Load (kg)	Total N Load/Unit Land Area (kg/ha)	Total N Percent Total Load
Otter Creek	2,884	7,124	2.47	12.03	50,861	17.64	11.27
Little Bimini[1]	1,528	13,481	8.82	22.76	38,031	24.89	8.43
N.W. Taylor Creek	4,938	417	0.08	1.00	17,459	3.54	3.87
Williamson Ditch	8,509	2,768	0.33	4.67	77,002	9.05	17.07
Upper Taylor Creek[1]	27,060	51,463	1.90	86.90	244,062	9.02	54.09
Mosquito Creek[2]	5,182	~~181,556~~	~~35.04~~	~~306.58~~	~~956,513~~	~~184.58~~	~~211.99~~
Nubbin Slough[2]	4,818	~~17,551~~	~~3.64~~	~~29.64~~	~~1,380,074~~	~~286.44~~	~~305.86~~
Henry Creek[2]	4,057	~~14,251~~	~~3.51~~	~~24.06~~	~~1,750,481~~	~~431.47~~	~~387.95~~
Lettuce Creek[2]	6,559	~~43,197~~	~~6.59~~	~~72.94~~	~~1,164,108~~	~~177.48~~	~~257.99~~
TC/NS Total (S-191)[1]	48,788	59,220	1.21	100.00	451,215	9.25	100.00

[1]Loads estimated
[2]Period of record 06/01/83 through 12/31/84

TABLE 19. Summary of 1983 Discharges for the Taylor Creek/Nubbin Slough Watershed and Major Subwatersheds.

	Land Area (ha)	Percent Total Land Area	Discharge (cms-days)	Percent Total Discharge	Discharge Per Unit Land Area (cms-days/ha)[3]
Otter Creek	2,884	5.9	135	5.0	0.05
Little Bimini[1]	1,528	3.1	71	2.6	0.05
N. W. Taylor Creek	4,938	10.1	173	6.4	0.04
Williamson Ditch	8,509	17.5	524	19.4	0.06
Upper Taylor Creek[1]	27,060	55.5	1,499	55.6	0.06
Mosquito Creek[2]	5,182	10.6	237	--	0.05
Nubbin Slough[2]	4,818	9.9	244	--	0.05
Henry Creek[2]	4,057	8.3	268	--	0.07
Lettuce Creek[2]	6,559	13.4	837	--	0.13
S-191 at Lake Okeechobee[1]	48,788	100.0	2,697	100.0	0.06

[1]Estimated
[2]Period of record 06/01/83 through 12/31/83
[3]cms-days x 86,400 = m^3/year

TABLE 20. Summary of Annual Means and Standard Deviations for Selected Parameters in the Otter Creek Subwatershed.

		O-PO4	T-PO4 (mg/l)	NO3	Total N	pH	Cond (umhos/cm)	Turb (NTU)	No. of Samples
pre BMP	1978	3.12[1] (.63)[2]	3.44 (.69)	.15 (.22)	9.18 (4.01)	6.86 (.18)	417 (68)	----	25
	1979	2.77 (.50)	3.01 (.60)	.13 (.19)	6.15 (2.19)	6.91 (.16)	356 (79)	5.6 (.19)	28
	1980	2.16 (1.20)	2.53 (1.55)	.13 (.17)	7.96 (6.41)	6.80 (.18)	392 (179)	9.2 (9.4)	23
	1981	1.45 (.67)	2.04 (2.28)	.44 (.52)	5.38 (6.21)	6.88 (.19)	367 (115)	4.4 (4.7)	23
implementation	1982	1.51 (.51)	1.65 (.52)	.41 (.30)	5.22 (5.22)	6.92 (.22)	326 (97)	11.1 (6.2)	26
	1983	1.59 (1.07)	1.90 (1.09)	.74 (.85)	4.39 (2.57)	6.78 (.25)	305 (113)	24.9 (39.9)	27
	1984[3]	2.52 (.62)	2.95 (.78)	.64 (.42)	5.67 (1.65)	7.13 (.16)	492 (162)	17.2 (15.1)	7

[1]Mean
[2]Standard deviation
[3]Period of record for 1984 01/01/84 through 07/31/84

TABLE 21. Summary of Annual Means and Standard Deviations for Selected Parameters in East Otter Creek.

		O-PO4 (mg/l)	T-PO4 (mg/l)	NO3 (mg/l)	Total N (mg/l)	pH	Cond (umhos/cm)	Turb (NTU)	No. of Samples
pre BMP	1979[1]	.31[2] (.37)[3]	.62 (.38)	.01 (.01)	2.36 (1.55)	6.37 (.23)	137 (106)	4.6 (1.2)	10
	1980	.08 (.23)	.41 (.45)	.18 (.45)	3.25 (3.54)	6.23 (.42)	179 (205)	11.1 (15.4)	21
	1981	.07 (.13)	.26 (.27)	.02 (.02)	1.94 (1.41)	6.66 (.38)	237 (444)	11.7 (28.8)	18
implementation	1982	.18 (.25)	.37 (.30)	.05 (.14)	2.51 (1.76)	6.55 (.43)	127 (25)	9.2 (7.7)	26
	1983	.14 (.23)	.23 (.21)	.01 (.02)	.96 (.36)	6.40 (.42)	123 (44)	3.8 (2.1)	25
	1984[4]	.20 (.29)	.35 (.28)	.02 (.01)	1.35 (.47)	7.14 (.18)	133 (27)	4.9 (2.8)	7

[1]Period of record for 1979, 09/05/79 through 12/31/79
[2]Mean
[3]Standard deviation
[4]Period of record for 1984 01/01/84 through 07/31/84

TABLE 22. Summary of Annual Means and Standard Deviations for Selected Parameters in the Little Bimini Subwatershed.

		O-PO4 (mg/l)	T-PO4 (mg/l)	NO3 (mg/l)	Total N (mg/l)	pH	Cond (omhos/cm)	Turb (NTU)	No. of Samples
pre BMP	1978	2.32[1] (.86)[2]	2.49 (.95)	1.09 (.74)	5.38 (2.26)	6.97 (.19)	324 (211)	----	24
	1979	1.23 (.62)	1.40 (.70)	1.09 (.77)	3.73 (1.63)	6.95 (.20)	229 (47)	3.2 (.7)	28
	1980	.65 (.50)	.78 (.47)	1.26 (.97)	3.12 (2.25)	6.99 (.21)	250 (70)	2.8 (1.2)	23
	1981	.87 (.71)	.93 (.73)	1.00 (.65)	2.73 (1.40)	7.22 (.24)	280 (66)	1.6 (.7)	24
implementation	1982	1.31 (.95)	1.42 (1.00)	1.75 (.99)	5.09 (1.73)	6.86 (.24)	332 (241)	6.9 (4.6)	26
	1983	2.42 (.57)	2.68 (.71)	2.69 (1.60)	6.59 (2.45)	6.96 (.30)	340 (107)	6.2 (3.2)	26
	1984[3]	2.00 (.87)	2.24 (1.08)	1.32 (.59)	5.16 (2.09)	7.22 (.22)	375 (122)	8.1 (6.3)	7

[1]Mean
[2]Standard deviation
[3]Period of record for 1984 01/01/84 through 07/31/84

TABLE 23. Summary of Annual Means and Standard Deviations for Selected Parameters in the N. W. Taylor Creek Subwatershed.

		O-PO4 (mg/l)	T-PO4 (mg/l)	NO3 (mg/l)	Total N (mg/l)	pH	Cond (umhos/cm)	Turb (NTU)	No. of Samples
pre BMP	1978	.37[1] (.14)[2]	.43 (.18)	.06 (.06)	1.75 (.42)	6.87 (.33)	156 (40)	----	23
	1979	.35 (.17)	.42 (.18)	.07 (.10)	1.62 (.66)	6.76 (.20)	140 (68)	2.3 (.7)	28
	1980	.29 (.18)	.34 (.19)	.06 (.04)	1.19 (.44)	6.84 (.28)	183 (54)	2.2 (1.2)	23
	1981	.32 (.32)	.38 (.36)	.07 (.09)	1.27 (.75)	7.13 (.20)	613 (705)	1.3 (1.2)	25
implementation	1982	.47 (.28)	.59 (.30)	.09 (.12)	1.92 (.51)	6.98 (.30)	187 (95)	7.2 (5.3)	26
	1983	.33 (.17)	.42 (.19)	.04 (.04)	1.22 (.42)	6.85 (.29)	182 (136)	4.6 (2.5)	25
	1984[3]	.66 (.17)	.71 (.17)	.07 (.09)	2.05 (.50)	7.36 (.22)	190 (47)	5.4 (3.1)	7

[1]Mean
[2]Standard deviation
[3]Period of record for 1984 01/01/84 through 07/31/84

TABLE 24. Summary of Annual Means and Standard Deviations for Selected Parameters in the Williamson Ditch Subwatershed.

		O-PO4 (mg/l)	T-PO4 (mg/l)	NO3 (mg/l)	Total N (mg/l)	pH	Cond (umhos/cm)	Turb (NTU)	No. of Samples
pre BMP	1978	.33[1] (.19)[2]	.54 (.39)	.09 (.10)	2.67 (2.30)	7.11 (.44)	1126 (692)	----	25
	1979	.26 (.16)	.34 (.17)	.10 (.22)	2.40 (1.52)	7.11 (.35)	1543 (1058)	----	28
	1980	.27 (.19)	.41 (.39)	.08 (.09)	2.19 (2.06)	7.34 (.12)	1714 (973)	----	23
	1981	.23 (.30)	.37 (.42)	.06 (.09)	1.84 (.96)	7.42 (.23)	2462	1.9	26
implementation	1982	.26 (.31)	.66 (1.20)	.14 (.22)	2.37 (1.27)	7.16 (.28)	1218 (1034)	11.2 (20.4)	25
	1983	.21 (.12)	.33 (.15)	.06 (.05)	1.63 (.53)	6.93 (.38)	958 (692)	10.2 (10.9)	25
	1984[3]	.17 (.07)	.26 (.10)	.04 (.03)	1.46 (.68)	7.20 (.41)	1114 (549)	8.2 (4.8)	9

[1]Mean
[2]Standard deviation
[3]Period of record for 1984 01/01/84 through 07/31/84

TABLE 25. Summary of Annual Means and Standard Deviations for Selected Parameters in the Mosquito Creek Subwatershed.

		O-P04 (mg/l)	T-P04 (mg/l)	N03 (mg/l)	Total N (mg/l)	pH	Cond (umhos/cm)	Turb (NTU)	No. of Samples
pre BMP	1978	2.73[1] (1.03)[2]	2.76 (.96)	1.43 (.85)	6.02 (3.15)	7.17 (.39)	621 (210)	----	25
	1979	3.53 (1.76)	3.60 (1.72)	1.41 (1.49)	10.16 (7.60)	7.24 (.27)	746 (294)	----	28
	1980	2.13 (.73)	2.29 (.83)	1.33 (1.28)	6.64 (2.70)	7.24 (.16)	804 (231)	----	23
	1981	1.82 (.82)	1.97 (.76)	1.96 (1.21)	5.89 (2.78)	7.38 (.20)	762 (220)	1.0 (.4)	26
	1982	1.39 (.36)	1.45 (.37)	1.63 (.86)	4.20 (1.30)	7.09 (.31)	501 (168)	4.7 (3.0)	26
	1983	1.62 (.39)	2.03 (1.46)	1.22 (.95)	4.46 (1.58)	6.98 (.35)	558 (401)	4.2 (2.2)	24
	1984[3]	2.62 (.84)	2.72 (.90)	1.81 (.74)	6.25 (2.33)	7.12 (.31)	820 (208)	4.6 (1.9)	9

[1]Mean
[2]Standard deviation
[3]Period of record for 1984 01/01/84 through 07/31/84

TABLE 26. Summary of Annual Means and Standard Deviations for Selected Parameters in the Nubbin Slough Subwatershed.

		O-PO4 (mg/l)	T-PO4 (mg/l)	NO3 (mg/l)	Total N (mg/l)	pH	Cond (umhos/cm)	Turb (NTU)	No. of Samples
pre BMP	1978	1.44[1] (.50)[2]	1.61 (.59)	.21 (.21)	4.82 (1.78)	6.84 (.27)	426 (244)	----	25
	1979	1.31 (.64)	1.82 (1.12)	.17 (.25)	6.53 (5.35)	6.70 (.18)	340 (136)	----	28
	1980	1.76 (.77)	2.33 (1.23)	.28 (.33)	8.52 (5.38)	6.76 (.15)	398 (112)	----	23
	1981	2.44 (1.38)	3.15 (1.78)	.26 (.47)	11.96 (11.67)	6.94 (.23)	554 (228)	----	26
implementation	1982	1.89 (1.24)	2.73 (2.77)	.17 (.18)	11.64 (13.72)	6.68 (.17)	477 (914)	14.0 (9.2)	27
	1983	1.80 (1.07)	2.33 (1.53)	.14 (.15)	7.04 (4.63)	6.69 (.23)	402 (342)	18.9 (18.7)	24
	1984[3]	1.45 (.45)	1.76 (.68)	.21 (.15)	4.78 (1.86)	7.13 (.25)	371 (96)	12.9 (7.6)	10

[1]Mean
[2]Standard deviation
[3]Period of record for 1984 01/01/84 through 07/31/84

TABLE 27. Summary of Annual Means and Standard Deviations for Selected Parameters in the Henry Creek Subwatershed.

		O-PO4 (mg/l)	T-PO4 (mg/l)	NO3 (mg/l)	Total N (mg/l)	pH	Cond (umhos/cm)	Turb (NTU)	No. of Samples
pre BMP	1981[1]	1.23[2] (.79)[3]	1.54 (.70)	.33 (.52)	5.89 (3.01)	----	----	----	14
	1982	1.15 (.74)	2.28 (3.22)	.27 (.43)	6.55 (3.60)	7.11 (.20)	794 (255)	6.7 (8.1)	22
implementation	1983	.99 (1.00)	2.28 (2.34)	.10 (.14)	7.44 (4.53)	6.92 (.34)	685 (348)	9.3 (11.8)	23
	1984[4]	1.17 (.58)	1.69 (.74)	.11 (.13)	4.97 (2.12)	7.16 (.20)	1005 (496)	6.3 (3.5)	10

[1]Period of record for 1981 06/11/81 through 12/31/81
[2]Mean
[3]Standard deviation
[4]Period of record for 1984 01/01/84 through 07/31/84

TABLE 28. Summary of Annual Means and Standard Deviations for Selected Parameters in the Lettuce Creek Subwatershed.

		O-PO4	T-PO4	NO3	Total N	pH	Cond (umhos/cm)	Turb (NTU)	No. of Samples
		(mg/l)							
pre BMP	1981[1]	.15[2] (.17)[3]	.22 (.20)	.05 (.06)	1.76 (.62)	----	----	----	14
	1982	.22 (.26)	.30 (.34)	.06 (.10)	2.02 (1.26)	6.99 (.32)	325 (173)	4.9 (3.3)	21
implementation	1983	.17 (.13)	.24 (.15)	.05 (.06)	1.46 (.34)	6.72 (.44)	337 (301)	5.2 (3.1)	24
	1984[4]	.21 (.20)	.25 (.20)	.05 (.05)	1.70 (.47)	7.04 (.28)	416 (134)	6.2 (2.1)	10

[1]Period of record for 1981 06/11/81 through 12/31/81
[2]Mean
[3]Standard deviation
[4]Period of record for 1984 01/01/84 through 07/31/84

TABLE 29. Summary of Annual Means and Standard Deviations for Selected Parameters for S-191 at Lake Okeechobee.

		O-PO4	T-PO	NO3	Total N	pH	Cond	Turb	No. of
		(mg/l)					(umhos/cm)	(NTU)	Samples
pre BMP	1978	.99[1] (.20)[2]	1.10 (.17)	.51 (.34)	2.65 (.64)	6.74 (.34)	496 (159)	4.2 (2.2)	29
	1979	.79 (.27)	1.00 (.16)	.57 (.46)	3.09 (.94)	6.72 (.30)	441 (162)	2.2 (1.4)	28
	1980	.88 (.20)	.99 (.16)	.53 (.44)	3.33 (.71)	6.96 (.33)	632 (135)	1.6 (.9)	24
	1981	.93 (.17)	1.03 (.26)	.63 (.55)	3.15 (.95)	7.46 (.57)	910 (334)	2.1 (1.8)	28
implementation	1982	.75 (.12)	.82 (.21)	.56 (.54)	2.70 (.57)	6.56 (.30)	459 (196)	2.9 (.9)	19
	1983	.64 (.09)	.75 (.09)	.37 (.37)	2.00 (.51)	6.52 (.29)	368 (144)	5.0 (3.4)	17
	1984	.85[3] (.12)	.94 (.08)	.71 (.35)	2.53 (.17)	6.89 (.22)	455 (143)	6.4 (7.4)	5

[1]Mean
[2]Standard deviation
[3]Period of record for 1984 01/04/84 through 04/19/84

APPENDIX 2

SCS STAFFING NEEDS

TAYLOR CREEK-NUBBIN SLOUGH

RURAL CLEAN WATER PROJECT

STAFFING BUDGET

SCS

FISCAL YEAR	RCWP (CC-80) FUNDS BUDGETED	RCWP (CC-80) FUNDS USED - PROJECTED	OTHER FUNDS USED
1982	$ 70,000	$ 97,908	$ 27,908
1983	81,000	81,000	
1984	73,929	73,929	
1985	45,245	45,245*	
1986	29,380	29,380*	
1987	3,895	3,895*	
TOTAL	$ 303,449	$ 331,357	$ 27,908

TOTAL PROJECT NEEDS	$ 331,357	
RCWP (CC-80) ALLOCATED		$ 303,449
OTHER FUNDS USED		
SCS Funds Absorbed		$ 15,908
State Funds		$ 12,000
TOTAL ALLOCATED TO DATE	$ 331,357	

* Projected

TAYLOR CREEK-NUBBIN SLOUGH RCWP STAFFING PLAN

Soil Conservation Service

NAME	PLANNING & PROMOTION 82	83	84	DESIGN 82	83	84	85	86	APPLICATION 82	83	84	85	86	CONTRACT PREPARATION & REVIEW 82	83	84	85	86	87
Sharpe	325	274	130	100	100	150	150	100	0	300	400	200	150	566	450	350	200	100	100
Cheyne	1392	1294	647	0	100	50	-	-	0	0	0	0	0	408	350	175	-	-	-
Boggs	300	1350	675	692	100	50	0	0	400	0	900	700	700	408	350	175	250	250	250
Technician I	300	0	0	240	360	360	360	270	110	1080	1080	1080	810	0	0	0	0	0	0
Technician II	0	0	0	0	360	360	360	270	0	1080	1080	1080	810	0	0	0	0	0	0
WAE	0	0	0	680	208	208	208	0	260	832	832	832	0	0	0	0	0	0	0
Tepper	0	900	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kendrik	70	0	0	200	270	590	320	150	0	100	50	0	0	0	0	0	0	0	0
Wilson	50	0	0	150	200	200	75	25	0	0	0	0	0	0	0	0	0	0	0
Lawrence	240	240	0	0	0	0	0	0	0	0	0	0	0	180	180	40	40	40	40
Column Totals	2677	4058	1452	2062	1698	1968	1473	815	770	3392	4342	3892	2470	1562	1330	740	490	390	390
Sub Totals			8187					8016					14866						4902
Grand Total																			35,971

SCS

RCWP STAFF NEEDS

SUMMARY

EMPLOYEE	84	85	86	87
Sharpe	1030	550	350	100
Cheyne	872	-	-	-
Boggs	1800	950	950	250
Technician I	1440	1440	1080	-
Technician II	1440	1440	1080	-
WAE	1040	1040	-	-
Kendrick	640	320	150	-
Wilson	200	75	25	-
Lawrence	40	40	40	40
TOTAL HOURS PER YEAR	8502	5855	3675	390

APPENDIX 3

RCWP REPORTS

ACP-305 Monthly Progress Report

RCWP-3 RCWP Project Needs, Goals and Accomplishments

RCWP-4 RCWP Estimated BMP Costs

RCWP-5 Fund Sources and Estimated Costs of RCWP Project

RCWP-7 RCWP Status Report

SCS Monthly Status Report

ACP-305
(6-29-79)

U.S. DEPARTMENT OF AGRICULTURE
Agricultural Stabilization and Conservation Service

MONTHLY PROGRESS REPORT

PROG. CODE	ST. & CO. CODE & C/D	REPT. DATE *(Mo, Day, Yr.)*
RCWP14	12 093 2	09 30 84

1. Allocation	975886	8. No. of LTA's App'd this FY	13
2. Total Amount Approved	503959	9. No. of ANA Referrals Outstanding	
3. Performance Amount Approved	151315	10. No. of ANA Referrals Issued	
4. Performance Amount Earned	134957	11. Value of ANA Referrals Outstanding	
5. Balance Available	488285	12. Value of ANA Returned Ref. & Other 245's Pend. App'l.	
6. Value of LTA's App'd. *(FY only)*		13. No. of LTA's Pending Approval	3
7. C/S Earned - LTA *(FY only)*		14. Value of LTA's Referred or Pending Approval	180000

MFO COPY

14

RCWP-3 (8-24-82)

U. S. DEPARTMENT OF AGRICULTURE
Agricultural Stabilization and Conservation Service

RCWP PROJECT NEEDS, GOALS AND ACCOMPLISHMENTS

1. PROJECT NAME: Taylor Creek-Nubbin Slough

2. STATE: Florida | 3. COUNTY: Okeechobee | 4. CRITICAL ACRES: 63,109

ACTIVITY	TOTAL NEEDS	GOALS	FISCAL YEAR ENDING 19 84		CUMULATIVE ACCOMPL.	FISCAL YEAR 19 85 GOALS
			GOALS	ACCOMPL.		
5	6	7	8	9	10	11
A. **Treatment Needs** 1) Acres needing treatment	63,109	47,332	20,000	12,460	39,726	23,383
2) Sources needing treatment a) Dairies (no.)	26*	26	13	3*	17	9
b) Feedlots (no.)						
c) Cattle	36	20	5	10	17	8
d) Citrus	2	2	0	0	0	1
e) Hog Farms	2	2	1	0	0	1
f)						
B. **RCWP Contracts** Number	54	37	11	13	28*	12

12. REMARKS

* Column 6 Dairy sources has been reduced because of the closing of 1 barn.
Column 9 Although only 3 signed, all dairy sources have signed RCWP 1's.
Column 10 totals have been reduced becaused 1 contract was canceled.

SIGNATURE *(ASCS County Executive Director)*	DATE	SIGNATURE *(SCS District Conservationist)*	DATE
J. W. Stanley	11/19/84	Louis C Boggs	11/19/84

RCWP-4
(6-24-80)

U. S. DEPARTMENT OF AGRICULTURE
Agricultural Stabilization and Conservation Service

RCWP ESTIMATED BMP COSTS

PROJECT: Taylor Creek-Nubbin Slough

STATE: Florida

ITEM	UNIT	TOTAL BMP COSTS				BMP COST SHARES			TECHNICAL ASSISTANCE										
											SCS		FS		SEA		OTHER	
	UNIT A	NO. OF UNITS B	INSTALLATION COST PER UNIT C	TOTAL COST (Thousands) D	C/S LEVEL E	RCWP F	FARMER G	OTHER H	HOUR FACTOR I	TOTAL HOURS J	HOURS K	COST L	HOURS M	COST N	HOURS O	COST P	HOURS Q	COST R
1. RCWP Plan of Work and Annual Review	Hours	5							19.4	97	97	819						
2. Water Quality Plans a. Development	Farms	54							127.4	6881	6881	58019						
b. Revisions	WQ Plans	89							74.1	6596	6596	55622						
c. Annual Status Review	WQ Plans	270							6.83	1722	1722	14505						
3. CODE: a. BMP- 1				3	0	0	2,875			1190	1190	10012						
b. BMP- 2	no	3	11000.00	33	75	24,902	8,300		820	2460	2460	20726						
c. BMP- 5	ft	35000	1.40	49	75	37,059	12,353		.05	1722	1722	14505						
d. BMP- 6				99	75	74,119	24,706			1107	1107	9316						
e. BMP- 8	ac	850	1.05	1	0	0	900		.80	681	681	6008						
f. BMP- 10				1258	75	943,702	314,567			11676	11676	98470						
g. BMP- 11				28	0	0	28,285			427	427	3582						
h. BMP- 12				33	75	24,468	8,156			712	712	5978						
i. BMP- 13	ac	4250	.18	1	0	0	750		.16	701	701	5887						
j. BMP-																		
k. BMP-																		
l. BMP-																		
m. BMP-																		
n. BMP-																		
o. BMP-																		
p. BMP-																		
q. BMP-																		
r. BMP-																		
s. BMP-																		
t. BMP-																		
Project Totals				1505		1,104,250	400,892			35972	35972	303449						

RCWP-5
(6-24-80)

U. S. DEPARTMENT OF AGRICULTURE
Agricultural Stabilization and Conservation Service

FUND SOURCES AND
ESTIMATED COSTS OF RCWP PROJECTS

PROJECT: Taylor Creek-Nubbin Slough
Okeechobee County

STATE: Florida

SOURCE OF FUNDS	FUNDED BY									TOTALS		
	FARMER A	ASCS B	CES SEA C	SCS D	FS E	ESCS F	EPA G	STATE H	SFWMD OTHER I	RCWP J	OTHER K	PROJECT L
1. BMP a. RCWP		1,104,250								1,104,250		
b. Other	400,892										400,892	
c. Totals	400,892	1,104,250										1,505,142
2. I & E a. RCWP			13,000							13,000		
b. Other												
c. Totals			13,000									13,000
3. Technical Assistance a. RCWP				303,449						303,449		
b. Other				12,000							12,000	
c. Totals				315,449								315,449
4. Monitoring and Eval. a. RCWP 1/												
b. Other									350,000		350,000	
c. Totals									350,000			350,000
Grand Totals	400,892	1,104,250	13,000	315,449					350,000	1,420,699	762,892	2,183,591

1/ Item 4a will be used only for projects approved for comprehensive monitoring.

RCWP-7
(11-25-81)

U. S. DEPARTMENT OF AGRICULTURE
Agricultural Stabilization and Conservation Service

RCWP STATUS REPORT

1. STATE: Florida

2. COUNTY NAME: Okeechobee-Martin

3. PROJECT NAME: Taylor Creek-Nubbin Slough

4. NO. IN CRITICAL AREA: A. FARMS 54; B. ACRES 63,109

5. BMP FUNDS APPROVED FOR PROJECT: $1,104,250.00

MONTH	NO. OF RCWP-1'S FILED	NO. PRIORITIES ESTABLISHED		NO. RCWP-1's TRANS-FERRED TO SCS	NO. WQ PLANS PRE-PARED AND RETURNED TO ASCS	NO. OF RCWP-2'S APPD. BY COC	NO. CANCELLED BY ASCS		NO. RCWP-1's WITH-DRAWN BY APPLI-CANT	CRITICAL ACRES UNDER CONTRACT		FUNDS UNDER CONTRACT	
		HIGH	LOW				RCWP-1'S	RCWP-2'S		ACRES	PER-CENT	AMOUNT	PER-CENT
6	7	8	9	10	11	12	13	14	15	16	17	18	19
Cumulative to Date	52	18	33	50	20	16	6	1	4	27,266	43%	373,713.00	34%
OCT	0	0	0	0	0	0	0	0	0	0		0	
NOV	0	0	0	0	3	0	1	0	0	0		0	
DEC	0	0	0	0	0	2	0	0	0	1,244		23,596.00	
JAN	0	0	0	0	1	1	7	0	0	328		22,032.00	
FEB	0	0	0	0	1	0	2	0	0	0		0	
MAR	0	0	0	0	1	2	0	0	0	303		18,248.00	
3-5 APR	1	0	0	0	2	1	0	0	0	1,353		51,209.00	
MAY	2	0	0	0	0	0	0	0	0	0		2,165.00	
JUN	2	1	2	3	0	0	0	0	0	0		5,125.00	
JUL	0	1	1	2	3	0	0	0	0	0		0	
AUG	0	1	0	1	4	5	1	0	0	8,465		88,106.00	
SEP	1	0	0	0	2	2	2	0	0	767		58,230.00	
Total to Date	57	21	36	56	37	29	19	1	4	39,726	63%	642,424.00	61%

20. REMARKS

21. VERIFIED AND APPROVED BY: (Signature) J. W. [signature]

TITLE: Okeechobee County Executive Director

DATE: October 1, 1984

TAYLOR CREEK-NUBBIN SLOUGH RCWP MONTHLY STATUS REPORT

WATERSHED- Taylor Creek-Main Branch

Date 9/24/84

Landowner	RCWP Rec.	Priority	acres	Plan Comp.	OK owner	OK SCS	OK SWCD	Plan to COC	OK COC	Date Contr.	Remarks	Critical Acres	Total Acres
Gilbert James	4/82	M-7	5	8/81		8/82	8/82				Owner declined plan	5	5
Rofra Corp.	10/81	M-13	1283	6/82	8/84	9/82	9/82	1/83	8/84	8/84	Contract #25	1283	1283
Dry Lake Dairy	11/82	M-22	764	9/83	9/83	10/83	10/83	11/83			Contract #18	764	764
SEZ Dairy	8/82	M-11	718	9/82	4/83	7/83	7/83	7/83	7/83	7/83	Contract #16	718	718
Charles Hilyer	5/83	M-27	1250								Plan cancelled at owners request	1250	1250
G Bar E Ranch	6/82	H-10	4646	9/82		11/82	11/82				Owner reviewing plan	1583	4646
D.R. Daniel	10/82	M-20	1546	7/83							Owner reviewing plan	1546	1546

1) Not able to bear cost
2) Don't feel they are causing a problem.
3) Concerned about cost-share re-payment if converts to urban.

TAYLOR CREEK-NUBBIN SLOUGH RCWP MONTHLY STATUS REPORT

WATERSHED- N.W. Taylor

Date 9/24/84 Page 2 of 9

Landowner	RCWP Rec.	Prior ity	acres	Plan Comp.	OK owner	OK SCS	OK SWCD	Plan to COC	OK COC	Date Contr.	Remarks	Critical Acres	Total Acres	
McArthur Farms A.I. Operation	8/81	H-1	*	12/81	1/82	12/81	12/81	1/82	1/82	1/82	Contract #1	*	*	Otter *-see Creek ■

1) Not able to bear cost
2) Don't feel they are causing a problem.
3) Concerned about cost-share re-payment if converts to urban.

TAYLOR CREEK-NUBBIN SLOUGH RCWP MONTHLY STATUS REPORT

WATERSHED- Little Bimini

Date 9/24/84 Page 3 of 9

Landowner	RCWP Rec.	Priority	acres	Plan Comp.	OK owner	OK SCS	OK SWCD	Plan to COC	OK COC	Date Centr.	Remarks	Critical Acres	Total Acres	
McArthur Farms Barn 5	8/81	H-1	*	12/81	1/82	12/81	12/81	1/82	1/82	1/82	Contract #1	*	*	Otter see-Creek
H.W. Rucks&Sons	9/81	H-5	*	3/82	3/82	3/82	3/82	3/82	3/82	3/82	Contract #5	*	*	Otter see-Creek
Roger Davis	3/81	H-9	84	4/82	4/82	4/82	4/82	4/82	6/82	6/82	Contract #6	84	84	
Bob Edwards	7/84	H-21	266	8/84							Owner signed new RCWP-1	266	266	
Lottie Raulerson	5/84	H-20	280	8/84	9/84	8/84	8/84	8/84	9/84			280	280	
Austin Raulerson	8/82	H-13	19									19	19	
Monroe Arnold	8/81	H-4	62	3/82	3/82	3/82	3/82	3/82	3/82	3/82	Contract #4	62	62	
Harley Arnold	10/82	H-17	197	10/82	12/82	11/82	11/82	12/82	1/83	3/83	Contract #10	197	197	

1) Not able to bear cost
2) Don't feel they are causing a problem.
3) Concerned about cost-share re-payment if converts to urban.

TAYLOR CREEK-NUBBIN SLOUGH RCWP MONTHLY STATUS REPORT

WATERSHED- Otter Creek

Date 9/24/84 Page 4 of 9

Landowner	RCWP Rec.	Priority	acres	Plan Comp.	OK owner	OK SCS	OK SWCD	Plan to COC	OK COC	Date Contr.	Remarks	Critical Acres	Total Acres	
McArthur Farms	8/81	H-1	14392	12/81	1/81	12/81	12/81	1/82	1/82	1/82	Contract #1	14392	14392	
Wilson Rucks	8/81	H-2	914	2/82	2/82	2/82	2/82	2/82	2/82	2/82	Contract #2	914	914	
H.W. Rucks&Sons	9/81	H-5	2147	3/82	3/82	3/82	3/82	3/82	3/82	3/82	Contract #5	2147	2147	
Earl Rucks	8/82	H-15	620	8/82	1/82	1/83	1/83	1/83	1/83	2/83	Contract #8	620	620	
Roy C. Arnold	8/82	H-14	51	8/82		8/82	8/82				Contract #26	51	51	
Clarence Arnold	6/82	H-11	81	7/82	9/82	8/82	8/82	9/82	3/83	3/83	Contract #9	81	81	
Marvin Arnold	6/82	H-12	32	7/82	7/82	7/82	9/82	9/82	12/82	1/83	Contract #7	32	32	
B.L. Hazellief	3/83	H-8	23	6/82		8/82	8/82				Owner declined plan(2	23	23	
Remilu Ranch	8/83	H-18	3352	3/84							Owner declined plam	3352	3352	
Natham Hazellief	3/82	H-7	297	6/82		8/82	8/82				Owner declined plan(2	297	297	
Sanford Gottlieb	3/82	H-6	109	8/84	8/84	6/84	6/84	7/84	8/84	9/84	Contract #27	109	109	

1) Not able to bear cost
2) Don't feel they are causing a problem.
3) Concerned about cost-share re-payment if converts to urban.

TAYLOR CREEK-NUBBIN SLOUGH RCWP MONTHLY STATUS REPORT

WATERSHED- Williamson Ditch

Date 9/24/84

Landowner	RCWP Rec.	Prior ity	acres	Plan Comp.	OK owner	OK SCS	OK SWCD	Plan to COC	OK COC	Date Contr.	Remarks	Critical Acres	Total Acres	
Roger Jones	10/81	M-4	2523	6/82	5/83	6/82	6/82	5/83	5/83	5/83	Contract #15	2523	2523	
Bill Williams	5/83	M-26	1945	9/83	10/83	10/83	1/84	1/84	1/84	3/84	Contract #21	1945	1945	
Jim Lashley	10/83	M-21	328	6/83	8/83	10/83	11/83	11/83	1/84	1/84	Contract #19	212	328	
Williamson Cattle Co.	5/84	M-30	7600	6/84	6/84	6/84	6/84	6/84	7/84	8/84	Contract #24	7600	7600	
E. Lawrence	8/82	M-13	159	9/82	3/84	11/82	11/82	3/84	3/84	3/84	Contract #20	159	159	

1) Not able to bear cost
2) Don't feel they are causing a problem.
3) Concerned about cost-share re-payment if converts to urban.

TAYLOR CREEK-NUBBIN SLOUGH RCWP MONTHLY STATUS REPORT

Date 9/24/84 Page 6 of 9

WATERSHED- Mosquito Creek

Landowner	RCWP Rec.	Priority	acres	Plan Comp.	OK owner	OK SCS	OK SWCD	Plan to COC	OK COC	Date Contr.	Remarks	Critical Acres	Total Acres	
Dudley Kirton	5/83	M-23	2720	9/83		12/83	12/83				Cancelled	223	2720	
Larson Dairy	9/84	H-21	2988									2988	2988	
Murphy White Dairy	10/82	M-16	675	8/84	8/84	9/84	9/84	9/84	9/84			675	675	

1) Not able to bear cost
2) Don't feel they are causing a problem.
3) Concerned about cost-share re-payment if converts to urban.

TAYLOR CREEK-NUBBIN SLOUGH RCWP MONTHLY STATUS REPORT

WATERSHED- Nubbin Slough

Date 9/24/84 Page 7 of 9

Landowner	RCWP Rec.	Priority	acres	Plan Comp.	OK owner	OK SCS	OK SWCD	Plan to COC	OK COC	Date Contr.	Remarks	Critical Acres	Total Acres	
Red Top Dairy	10/81	M-1	865								Plan in progress	865	865	
Berman, Kahn, Johnson	6/83	M-24	1792	12/83		1/84	1/84				Owner reviewing plan	427	1792	
Berman Estates	6/83	M-25	317	10/83	8/84	10/83	10/83	8/84			Contract #28	317	317	
Posey Dairy	4/82	M-5	317	9/82		9/82	9/82				Owner declined plan (2	317	317	
Newcomer Dairy	10/81	M-2	1020	9/82	12/82	12/82	12/82	12/82	4/83	5/83	Contract #14	1020	1020	
New Palm Dairy	10/81	M-19	1071	9/82	12/82	12/82	12/82	12/82	4/83	5/83	Contract #13	1071	1071	
F. Cunningham	5/84	M-32	120	5/84	5/84	5/84	5/84	5/84	7/84	8/84	Contract #23	120	120	
Davie Dairy	8/82	M-12	960	4/83	4/83	4/83	4/83	4/83	4/83	4/83	Contract #12	960	960	
Freeman Hales	8/82	M-14									Owner request RCWP-1 be cancelled			
Harvey Cattle	10/82	M-18	480	8/83	9/83	10/83	10/83	11/83	12/83	12/83	Contract #17	480	480	
Lou Cox Jr.	5/84	M-31	464	6/84	6/84	6/84	6/84	6/84	7/84	8/84	Contract #22	464	464	

1) Not able to bear cost
2) Don't feel they are causing a problem.
3) Concerned about cost-share re-payment if converts to urban.

TAYLOR CREEK-NUBBIN SLOUGH RCWP MONTHLY STATUS REPORT

WATERSHED- Henry Creek

Date 9/24/84 Page 8 of 9

Landowner	RCWP Rec.	Prior ity	acres	Plan Comp.	OK owner	OK SCS	OK SWCD	Plan to COC	OK COC	Date Contr.	Remarks	Critical Acres	Total Acres	
Enrico Dairy	4/82	M-6	2445	9/82	12/82	11/82	11/82	2/83	4/83	4/83	Contract #11	2445	2445	

1) Not able to bear cost
2) Don't feel they are causing a problem.
3) Concerned about cost-sharo re-payment if converts to urban.

TAYLOR CREEK-NUBBIN SLOUGH RCWP MONTHLY STATUS REPORT

WATERSHED- Lettuce Creek

Date 9/24/84 Page 9 of 9

Landowner	RCWP Rec.	Prior ity	acres	Plan Comp.	OK owner	OK SCS	OK SWCD	Plan to COC	OK COC	Date Contr.	Remarks	Critical Acres	Total Acres	
Ed Underhill	11/83	MM-2	320	12/83	1/84	1/84	1/84				Owner declined plan (1,2	320	320	
Roger Melear	3/81	MM-1	990	12/83	1/84	1/84	1/84	2/84	4/84	4/84	Contract #1 (Martin Co.)	990	990	

1) Not able to bear cost
2) Don't feel they are causing a problem.
3) Concerned about cost-share re-payment if converts to urban.

APPENDIX 4

WATER CHEMISTRY DATA

Mean, Minimum, and Maximum Water Quality Values for the Dairy Runoff Stations in Otter Creek for 1983. (Chemical parameters are expressed in mg/l.)

PARAMETERS		STATION 31	STATION 25	STATION 23	STATION 19
O-PO4	$\bar{x}$	2.12	5.70	1.93	0.14
	min-max	0.07-5.28	0.96-10.44	0.26-9.29	.005-0.88
T-PO4	$\bar{x}$	2.54	6.18	2.53	0.23
	min-max	0.24-5.50	1.04-13.83	0.42-9.60	0.04-0.78
NO3	$\bar{x}$	0.36	0.22	0.19	0.01
	min-max	.004-3.44	.004-1.57	.004-1.56	.004-0.08
NH4	$\bar{x}$	3.39	1.11	11.41	0.04
	min-max	0.03-11.26	0.01-3.62	1.91-69.86	0.01-0.29
INORGANIC N	$\bar{x}$	3.81	1.37	11.67	0.05
	min-max	0.04-11.41	0.02-4.29	2.20-69.99	0.01-0.29
TOTAL N	$\bar{x}$	7.48	4.82	19.10	0.96
	min-max	1.34-26.91	1.84-8.18	3.92-129.49	0.36-1.72
LAB COND (umhos/cm)	$\bar{x}$	468	620	488	123
	min-max	125-700	178-880	235-1750	90-295
LAB pH	$\bar{x}$	6.77	7.22	6.88	6.40
	min-max	6.29-7.26	6.65-8.00	6.16-7.61	5.62-7.14
TURBIDITY (NTU)	$\bar{x}$	10.9	2.8	16.3	3.8
	min-max	2.7-31.0	0.9-11.3	2.2-77.5	1.6-9.0
COLOR	$\bar{x}$	150	310	262	94
	min-max	47-351	164-572	84-390	17-308
NUMBER OF SAMPLES		18	24	23	25

Mean, Minimum, and Maximum Water Quality Values for the Open Channel Stations in Otter Creek for 1983. (Chemical parameters are expressed in mg/l.)

PARAMETERS		STATION 03	STATION 04	STATION 06
O-PO4	$\overline{x}$	1.94	1.76	1.59
	min-max	0.28-5.52	0.39-3.98	0.25-3.90
T-PO4	$\overline{x}$	2.30	2.28	1.90
	min-max	0.56-5.90	0.64-5.19	0.40-4.11
NO3	$\overline{x}$	0.37	0.41	0.74
	min-max	.004-3.44	.004-2.52	.004-3.62
NH4	$\overline{x}$	2.60	2.40	1.64
	min-max	0.04-12.50	0.01-8.81	0.01-5.78
INORGANIC N	$\overline{x}$	3.02	2.90	2.51
	min-max	0.12-12.92	0.12-9.42	0.02-8.17
TOTAL N	$\overline{x}$	4.81	5.52	4.39
	min-max	1.19-15.71	1.13-16.71	0.62-10.00
LAB COND (umhos/cm)	$\overline{x}$	416	373	305
	min-max	140-767	114-622	130-490
LAB pH	$\overline{x}$	6.72	6.80	6.78
	min-max	5.56-7.28	6.03-7.23	6.27-7.18
TURBIDITY (NTU)	$\overline{x}$	33.7	53.0	24.9
	min-max	3.4-615.0	2.5-550.0	1.7-174.0
COLOR	$\overline{x}$	145	178	138
	min-max	59-240	78-332	55-240
NUMBER OF SAMPLES		27	27	27

Mean, Minimum, and Maximum Water Quality Values for Beef Cattle (20 & 24) and Hayfield (27) Runoff Stations in Otter Creek for 1983. (Chemical parameters are expressed in mg/l.)

PARAMETERS		STATION 20	STATION 24	STATION 27
O-PO4	$\bar{x}$	0.25	0.27	0.23
	min-max	0.01-0.60	.006-1.35	0.01-1.02
T-PO4	$\bar{x}$	0.35	0.45	0.36
	min-max	0.07-0.77	0.04-1.29	0.07-1.22
NO3	$\bar{x}$	.005	0.05	0.01
	min-max	.004-0.01	.004-0.69	.004-0.07
NH4	$\bar{x}$	0.04	0.29	0.05
	min-max	0.01-0.08	0.01-2.34	0.01-0.14
INORGANIC N	$\bar{x}$	0.05	0.35	0.06
	min-max	0.01-0.10	0.01-2.46	0.01-0.16
TOTAL N	$\bar{x}$	1.26	2.14	1.44
	min-max	0.75-1.97	0.79-4.24	0.60-5.16
LAB COND (umhos/cm)	$\bar{x}$	257	377	164
	min-max	95-375	175-720	93-245
LAB pH	$\bar{x}$	6.51	6.50	6.10
	min-max	6.12-7.01	5.72-7.11	5.14-7.34
TURBIDITY (NTU)	$\bar{x}$	3.2	7.1	10.9
	min-max	1.6-10.5	1.5-19.3	1.6-41.0
COLOR	$\bar{x}$	201	129	155
	min-max	34-300	40-378	38-367
NUMBER OF SAMPLES		18	16	17

Mean, Minimum, and Maximum Water Quality Values for the Open Channel Stations in N. W. Taylor Creek (01) and Little Bimini (02 & 104) for 1983. (Chemical parameters are expressed in mg/l.)

PARAMETERS		STATION 01	STATION 02	STATION 104
O-PO4	$\overline{x}$	0.33	2.42	4.39
	min-max	0.08-0.80	1.52-3.74	3.17-6.05
T-PO4	$\overline{x}$	0.42	2.68	4.98
	min-max	0.13-0.80	1.62-4.06	3.81-6.76
NO3	$\overline{x}$	0.04	2.69	0.07
	min-max	.004-0.14	0.08-5.45	.004-0.337
NH4	$\overline{x}$	0.04	2.16	10.22
	min-max	0.01-0.14	0.01-6.55	1.42-18.85
INORGANIC N	$\overline{x}$	0.08	5.07	10.31
	min-max	0.01-0.30	0.83-9.04	1.62-18.85
TOTAL N	$\overline{x}$	1.22	6.59	12.82
	min-max	0.29-1.87	2.47-10.76	4.47-20.92
LAB COND (umhos/cm)	$\overline{x}$	182	340	564
	min-max	72-720	116-520	265-770
LAB pH	$\overline{x}$	6.85	6.96	6.71
	min-max	6.01-7.17	6.26-7.35	6.15-7.02
TURBIDITY (NTU)	$\overline{x}$	4.6	6.2	12.8
	min-max	1.3-12.6	1.4-13.9	2.7-67.0
COLOR	$\overline{x}$	183	158	171
	min-max	47-376	79-296	78-293
NUMBER OF SAMPLES		27	27	24

Mean, Minimum, and Maximum Water Quality Values for the Open Channel Stations in the Main Branch of Taylor Creek. (Chemical parameters are expressed in mg/l.)

PARAMETERS		STATION 11	STATION 12	STATION 18
O-PO4	$\overline{x}$	0.56	0.84	0.63
	min-max	0.27-1.01	0.42-1.39	0.13-1.11
T-PO4	$\overline{x}$	0.65	0.98	0.72
	min-max	0.38-1.09	0.63-1.45	0.20-1.25
NO3	$\overline{x}$	0.47	0.85	0.68
	min-max	.004-2.02	.004-2.15	.004-2.35
NH4	$\overline{x}$	0.11	0.24	0.17
	min-max	0.01-0.71	0.01-0.83	0.01-0.65
INORGANIC N	$\overline{x}$	0.62	1.16	0.88
	min-max	0.01-2.33	0.01-2.38	0.02-3.08
TOTAL N	$\overline{x}$	1.94	2.54	2.04
	min-max	0.97-3.41	1.09-4.51	1.06-4.00
LAB COND (umhos/cm)	$\overline{x}$	677	359	366
	min-max	115-3210	130-940	128-840
LAB pH	$\overline{x}$	7.03	7.08	7.23
	min-max	6.21-7.66	6.17-7.73	6.49-7.94
TURBIDITY (NTU)	$\overline{x}$	5.4	7.7	7.3
	min-max	1.5-25.0	1.1-15.4	2.3-15.3
COLOR	$\overline{x}$	161	154	137
	min-max	1-287	1-395	71-323
NUMBER OF SAMPLES		25	23	19

Mean, Minimum, and Maximum Water Quality Values for the Open Channel Stations at Williamson Ditch for 1983. (Chemical parameters are expressed in mg/l.)

PARAMETERS		STATION 07	STATION 08	STATION 09
O-PO4	$\overline{x}$	0.12	0.28	0.21
	min-max	0.04-0.30	0.01-0.71	0.06-0.63
T-PO4	$\overline{x}$	0.17	0.35	0.33
	min-max	0.08-0.37	0.06-0.83	0.10-0.75
NO3	$\overline{x}$	0.01	0.03	0.06
	min-max	.004-0.05	.004-.0.09	.004-0.17
NH4	$\overline{x}$	0.07	0.06	0.12
	min-max	0.01-0.23	0.01-0.22	0.01-0.77
INORGANIC N	$\overline{x}$	0.08	0.11	0.19
	min-max	0.01-0.26	0.01-0.28	0.01-0.93
TOTAL N	$\overline{x}$	1.39	1.62	1.63
	min-max	0.83-2.13	0.97-2.54	0.80-3.00
LAB COND (umhos/cm)	$\overline{x}$	898	1702	958
	min-max	80-4150	195-5000	155-3100
LAB pH	$\overline{x}$	6.97	7.04	6.93
	min-max	6.02-7.62	5.95-7.82	6.04-7.50
TURBIDITY (NTU)	$\overline{x}$	5.2	4.3	10.0
	min-max	1.2-13.6	0.6-8.7	1.0-45.0
COLOR	$\overline{x}$	167	174	163
	min-max	1-289	1-319	1-313
NUMBER OF SAMPLES		25	25	25

Mean, Minimum, and Maximum Water Quality Values for the Open Channel Stations in Mosquito Creek for 1983. (Chemical parameters are expressed in mg/l.)

PARAMETERS		STATION 13	STATION 15
O-PO4	$\overline{x}$	1.63	1.50
	min-max	0.86-2.33	0.86-2.60
T-PO4	$\overline{x}$	2.03	1.63
	min-max	0.96-8.61	1.01-3.01
NO3	$\overline{x}$	1.22	0.49
	min-max	0.14-4.47	.004-1.81
NH4	$\overline{x}$	1.34	2.73
	min-max	0.07-4.00	0.10-5.78
INORGANIC N	$\overline{x}$	2.65	3.24
	min-max	0.53-5.30	0.74-7.66
TOTAL N	$\overline{x}$	4.46	4.96
	min-max	1.87-6.70	2.21-10.39
LAB COND	$\overline{x}$	558	498
(umhos/cm)	min-max	185-2310	190-1710
LAB pH	$\overline{x}$	6.98	6.88
	min-max	6.13-7.54	6.18-7.35
TURBIDITY	$\overline{x}$	4.2	5.2
(NTU)	min-max	1.7-11.7	1.4-18.2
COLOR	$\overline{x}$	203	186
	min-max	41-364	15-385
NUMBER OF SAMPLES		24	22

Mean, Minimum, and Maximum Water Quality Values for the Open Channel Stations in Nubbin Slough for 1983. (Chemical parameters are expressed in mg/l.)

PARAMETERS		STATION 17	STATION 14
O-PO4	$\overline{x}$	0.43	1.80
	min-max	0.07-1.43	0.69-4.10
T-PO4	$\overline{x}$	0.66	2.33
	min-max	0.22-2.32	0.80-6.12
NO3	$\overline{x}$	.005	0.14
	min-max	.004-0.01	.004-0.54
NH4	$\overline{x}$	0.53	2.65
	min-max	0.01-6.42	0.28-8.91
INORGANIC N	$\overline{x}$	0.54	2.84
	min-max	0.01-6.44	0.35-8.92
TOTAL N	$\overline{x}$	3.72	7.04
	min-max	0.70-13.97	1.80-19.14
LAB COND (umhos/cm)	$\overline{x}$	118	402
	min-max	52-700	120-1870
LAB pH	$\overline{x}$	5.94	6.69
	min-max	5.16-6.85	5.97-7.16
TURBIDITY (NTU)	$\overline{x}$	52.3	18.9
	min-max	1.6-310.0	1.9-78.0
COLOR	$\overline{x}$	230	289
	min-max	100-513	122-556
NUMBER OF SAMPLES		22	24

Mean, Minimum, and Maximum Water Quality Values for the Open Channel Stations at Henry Creek (39) and Lettuce Creek (40) for 1983. (Chemical parameters are expressed in mg/l.)

PARAMETERS		STATION 39	STATION 40
O-PO4	$\bar{x}$	0.99	0.17
	min-max	0.29-4.62	0.02-0.47
T-PO4	$\bar{x}$	2.28	0.24
	min-max	0.58-10.78	0.05-0.63
NO3	$\bar{x}$	0.10	0.05
	min-max	0.01-0.56	0.01-0.22
NH4	$\bar{x}$	3.91	0.12
	min-max	0.50-10.48	0.01-0.39
INORGANIC N	$\bar{x}$	4.02	0.19
	min-max	0.63-10.49	0.04-0.65
TOTAL N	$\bar{x}$	7.44	1.46
	min-max	1.29-18.86	0.62-2.01
LAB COND (umhos/cm)	$\bar{x}$	685	337
	min-max	170-1900	69-1560
LAB pH	$\bar{x}$	6.92	6.72
	min-max	6.28-7.48	5.28-7.49
TURBIDITY (NTU)	$\bar{x}$	9.3	5.2
	min-max	2.0-60.0	1.8-14.1
COLOR	$\bar{x}$	258	239
	min-max	125-373	58-366
NUMBER OF SAMPLES		24	24

Mean, Minimum, and Maximum Water Quality Values for S-191 at Lake Okeechobee for 1983. (Chemical parameters are expressed in mg/l.)

PARAMETERS		S-191
O-PO4	$\bar{x}$	0.64
	min-max	0.49-0.84
T-PO4	$\bar{x}$	0.75
	min-max	0.61-0.90
NO3	$\bar{x}$	0.37
	min-max	0.02-1.33
NH4	$\bar{x}$	0.27
	min-max	0.02-0.65
INORGANIC N	$\bar{x}$	0.64
	min-max	0.25-1.67
TOTAL N	$\bar{x}$	2.00
	min-max	1.25-2.99
LAB COND (umhos/cm)	$\bar{x}$	368
	min-max	191-685
LAB pH	$\bar{x}$	6.52
	min-max	6.01-6.96
TURBIDITY (NTU)	$\bar{x}$	5.0
	min-max	2.1-13.5
COLOR	$\bar{x}$	239
	min-max	125-335
NUMBER OF SAMPLES		17

APPENDIX 5

WATER QUALITY TIME SERIES GRAPHS

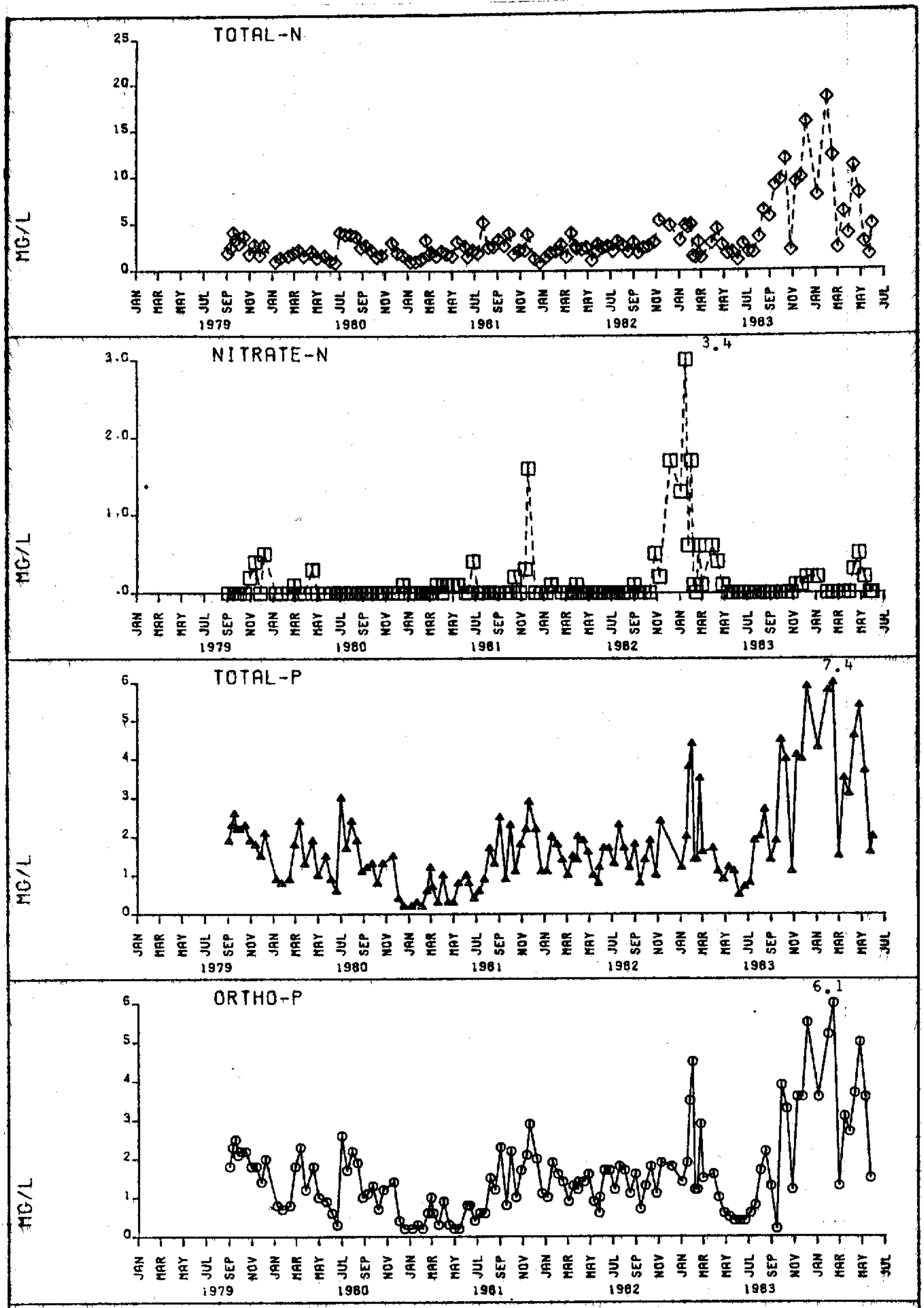


FIGURE OTTER CREEK STATION 03

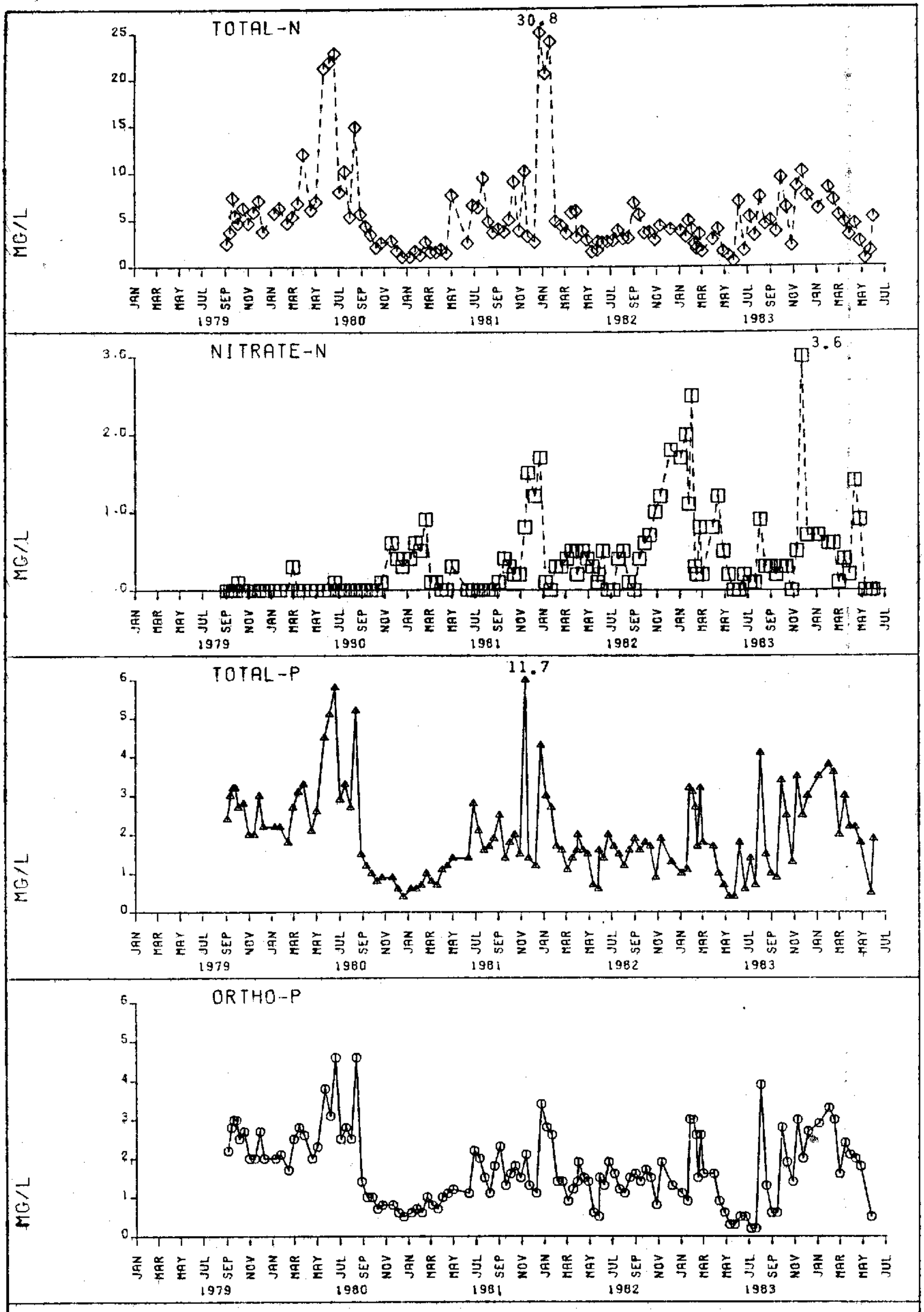


FIGURE OTTER CREEK STATION 06

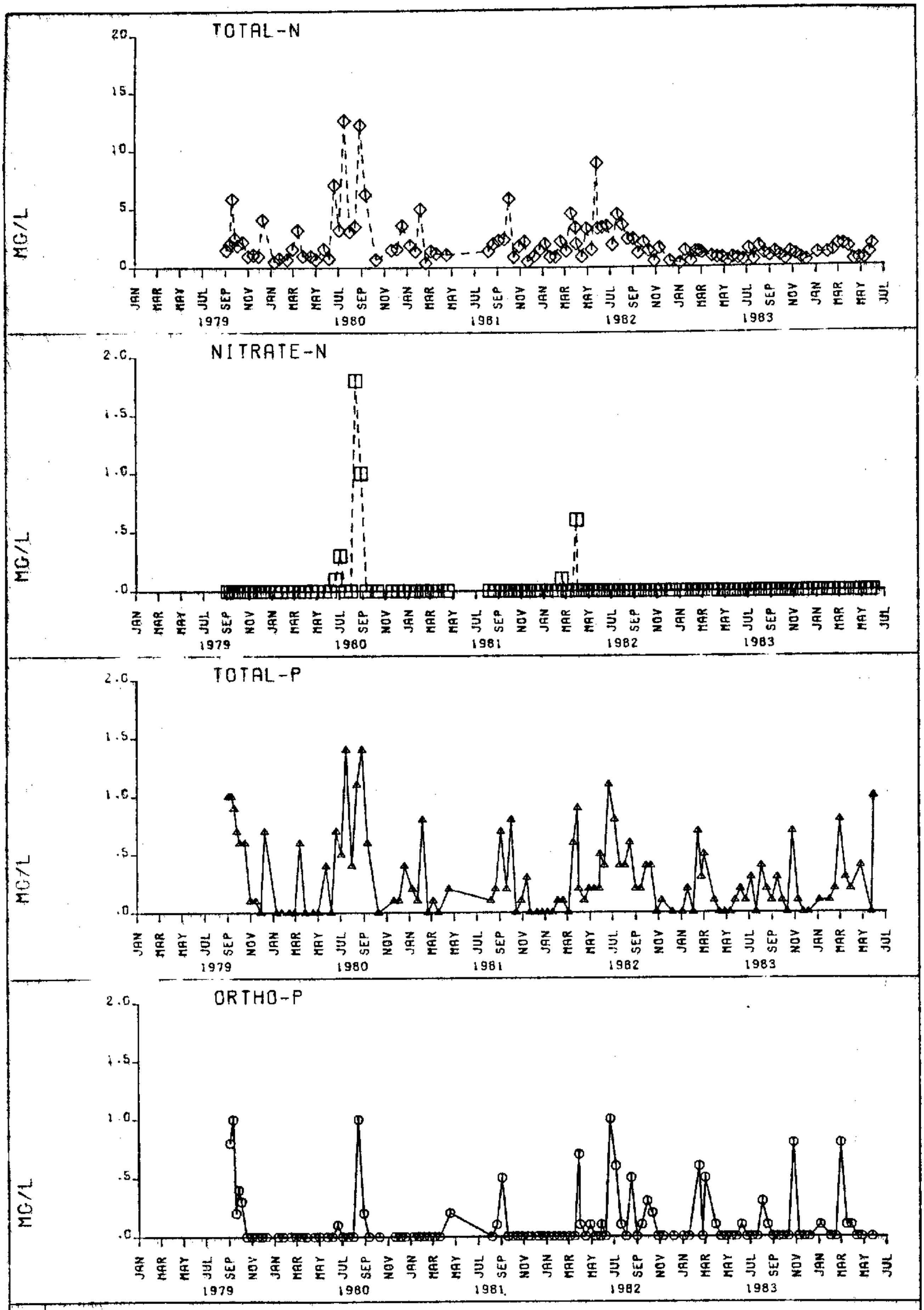


FIGURE EAST OTTER CREEK STATION 19

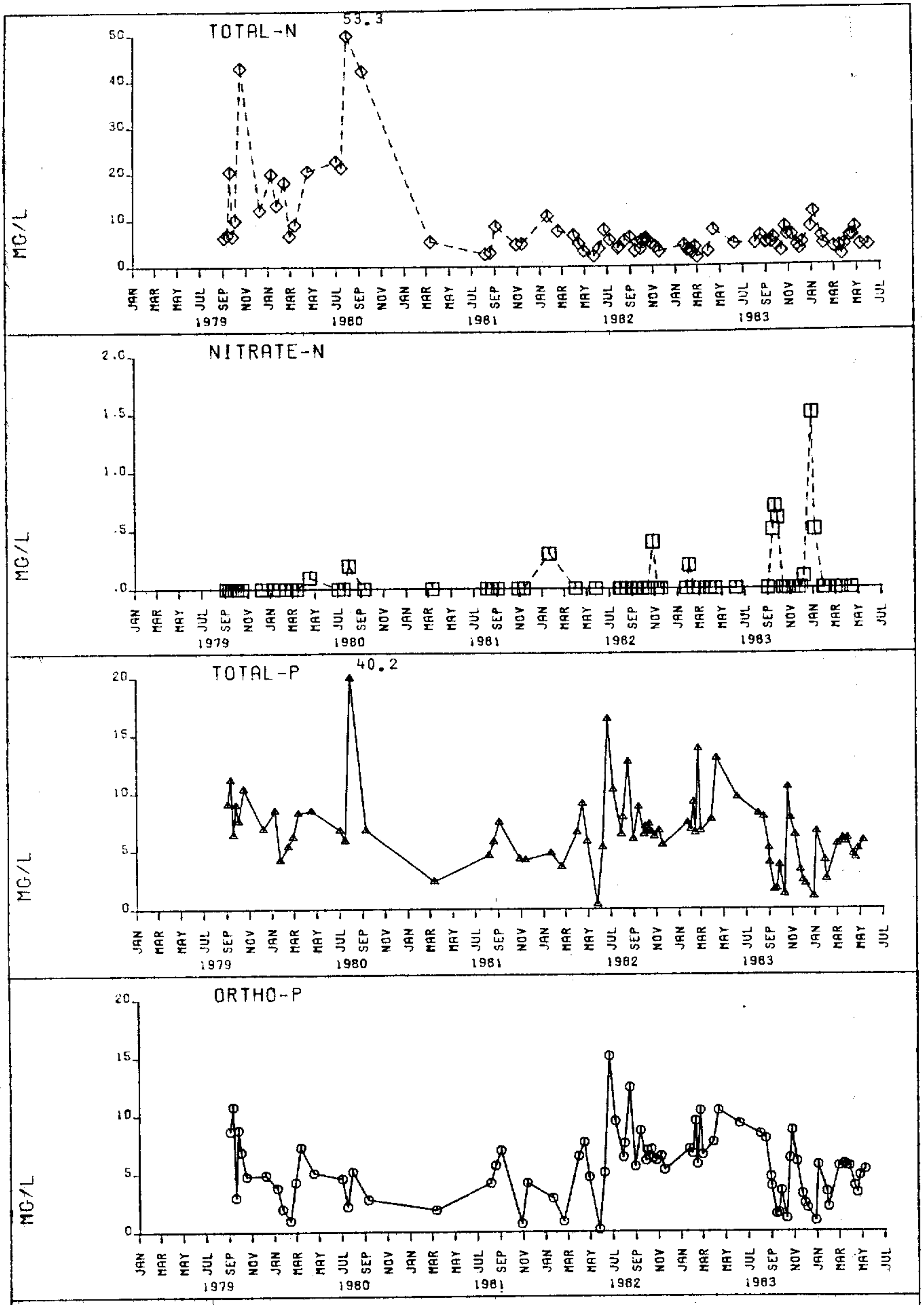


FIGURE OTTER CREEK STATION 25

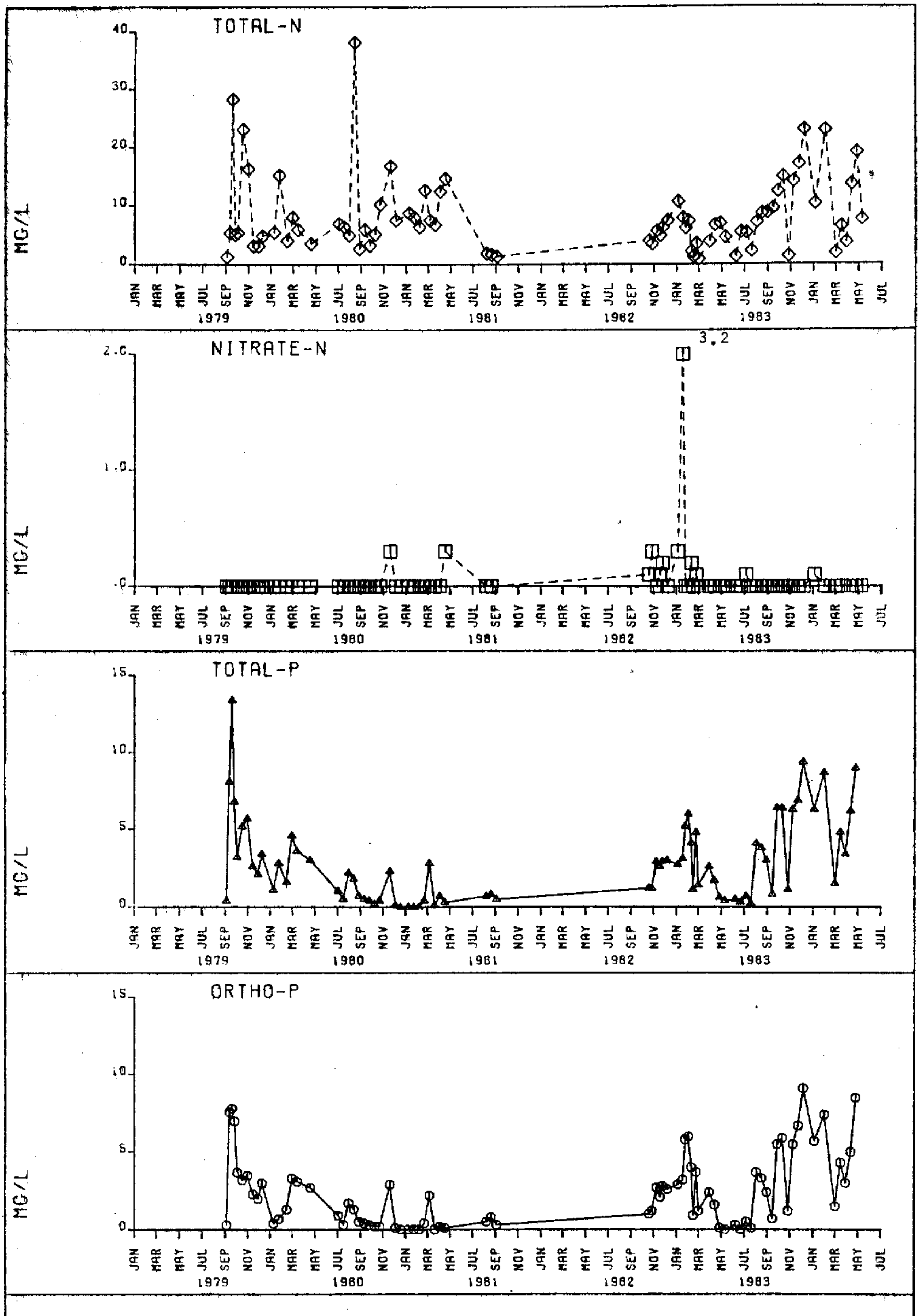


FIGURE OTTER CREEK STATION 26

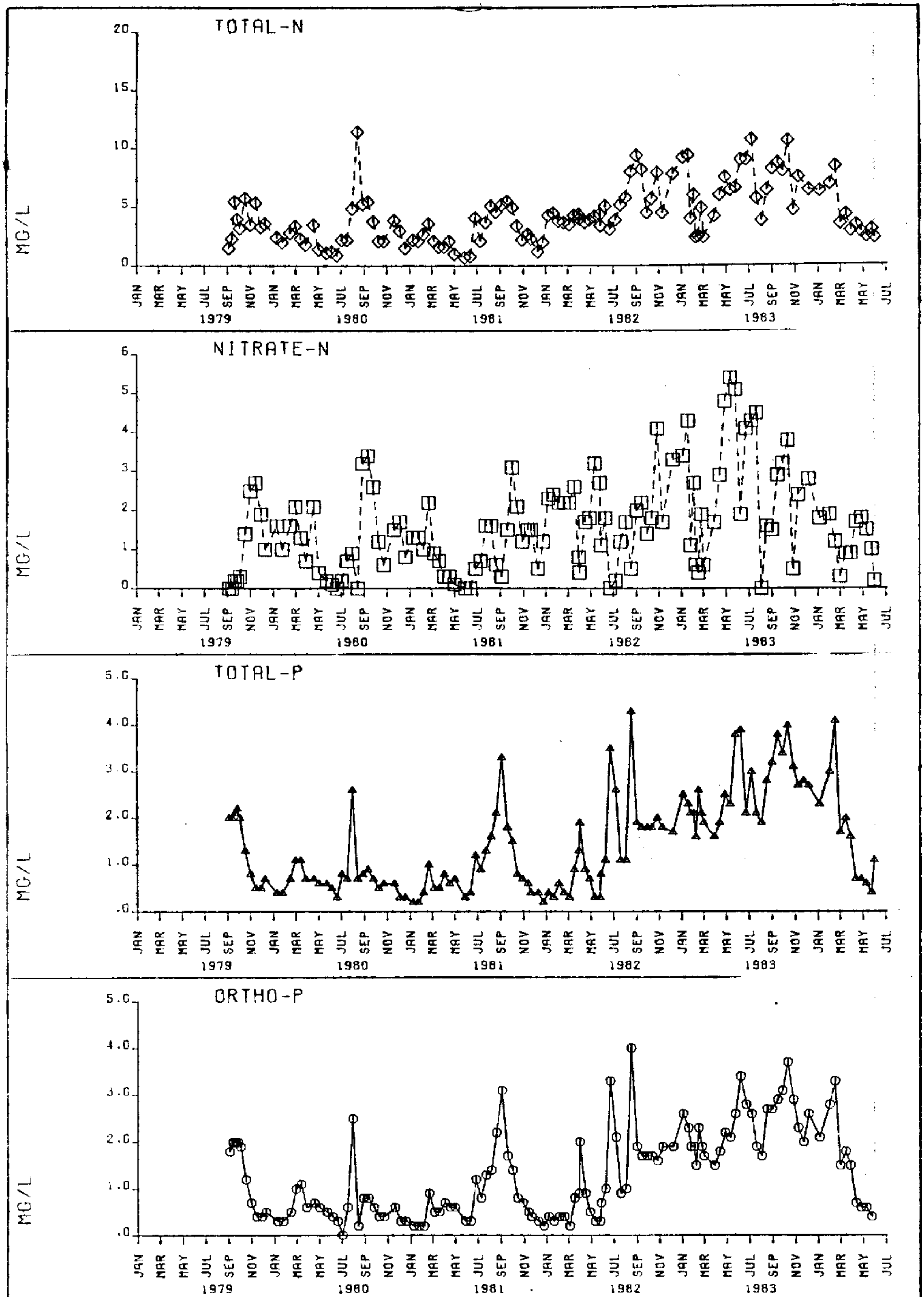


FIGURE LITTLE BIMINI STATION 02

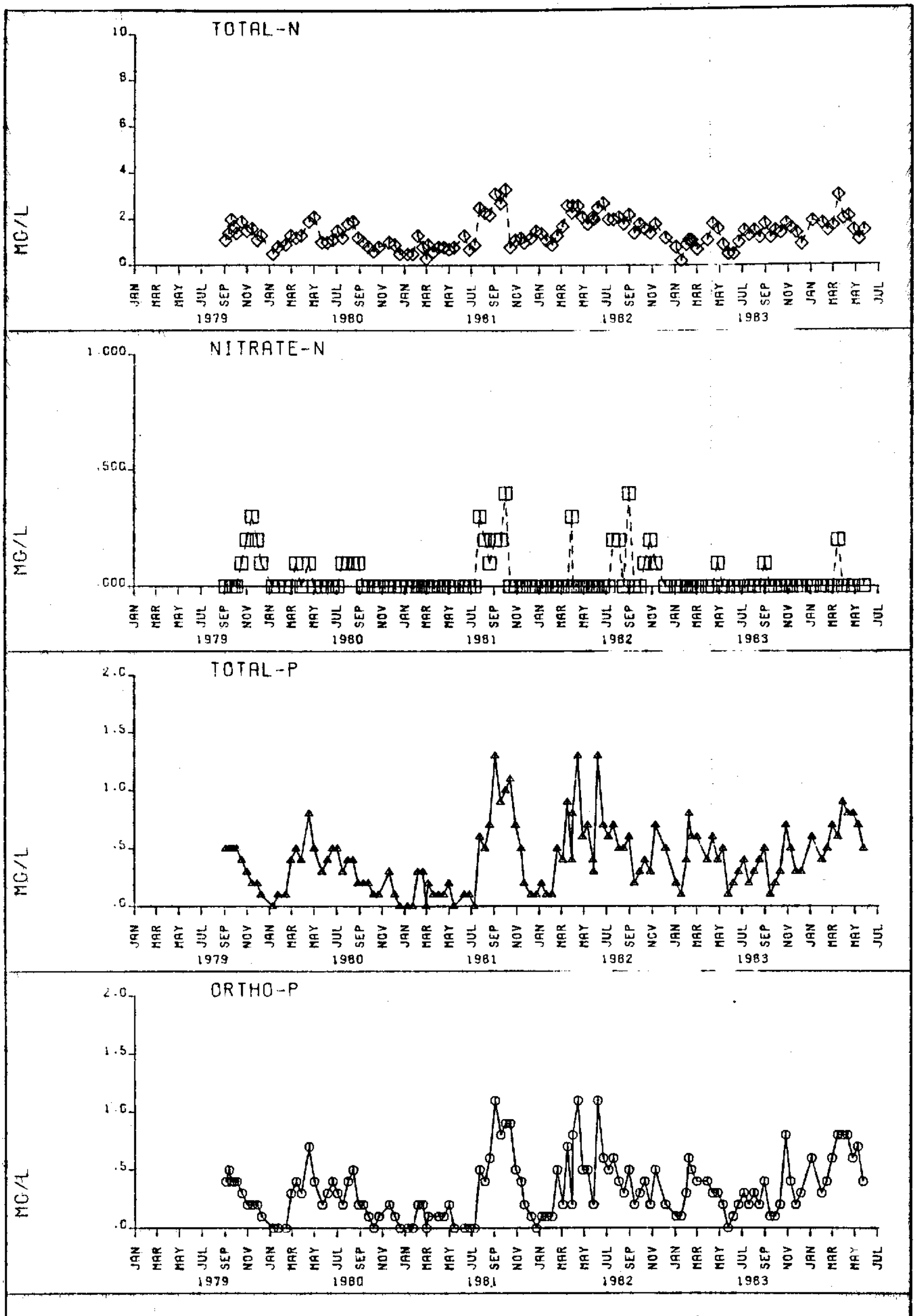


FIGURE N.W. TAYLOR CREEK STATION 01

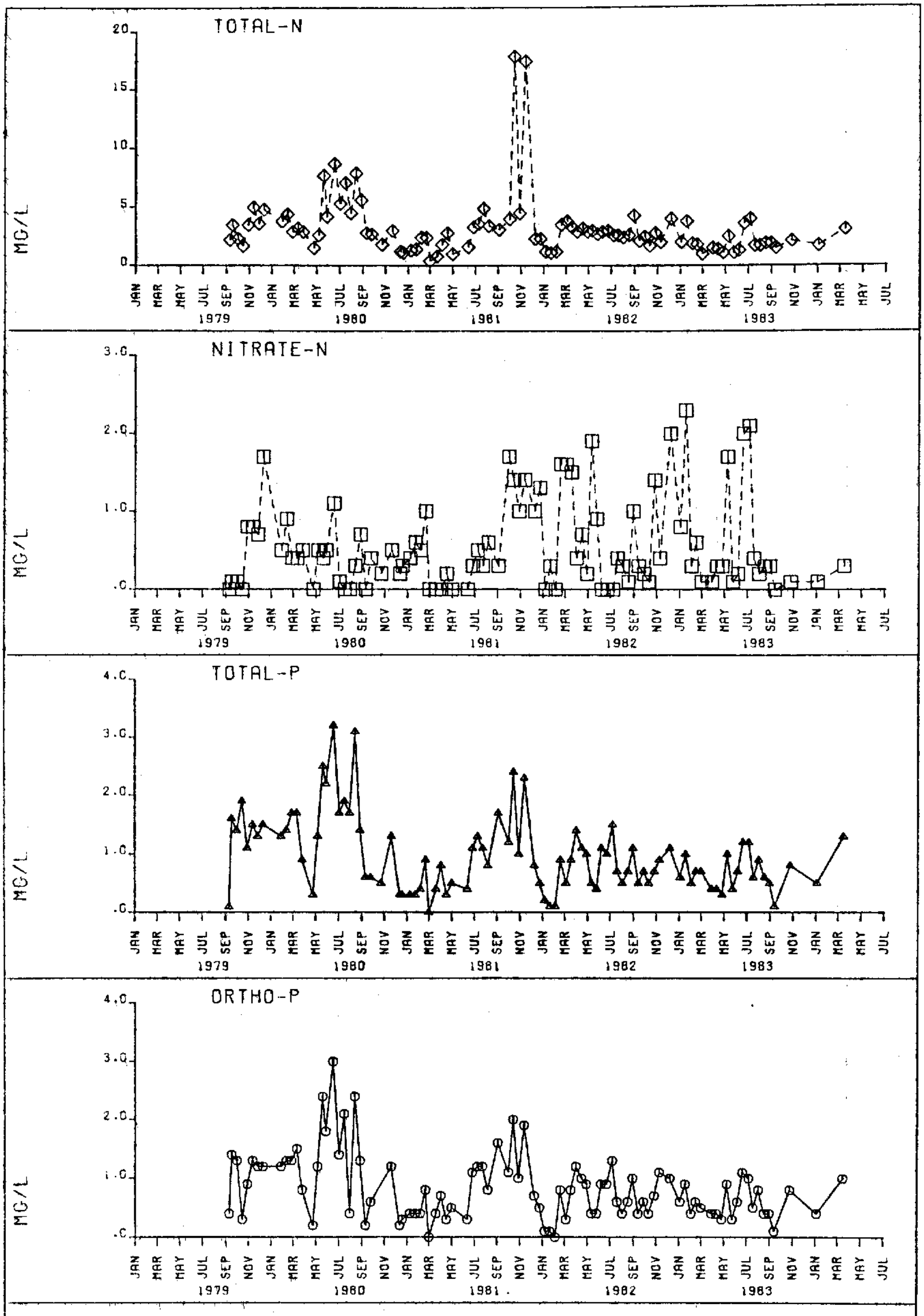


FIGURE HEADWATERS CONFLUENCE STATION 18

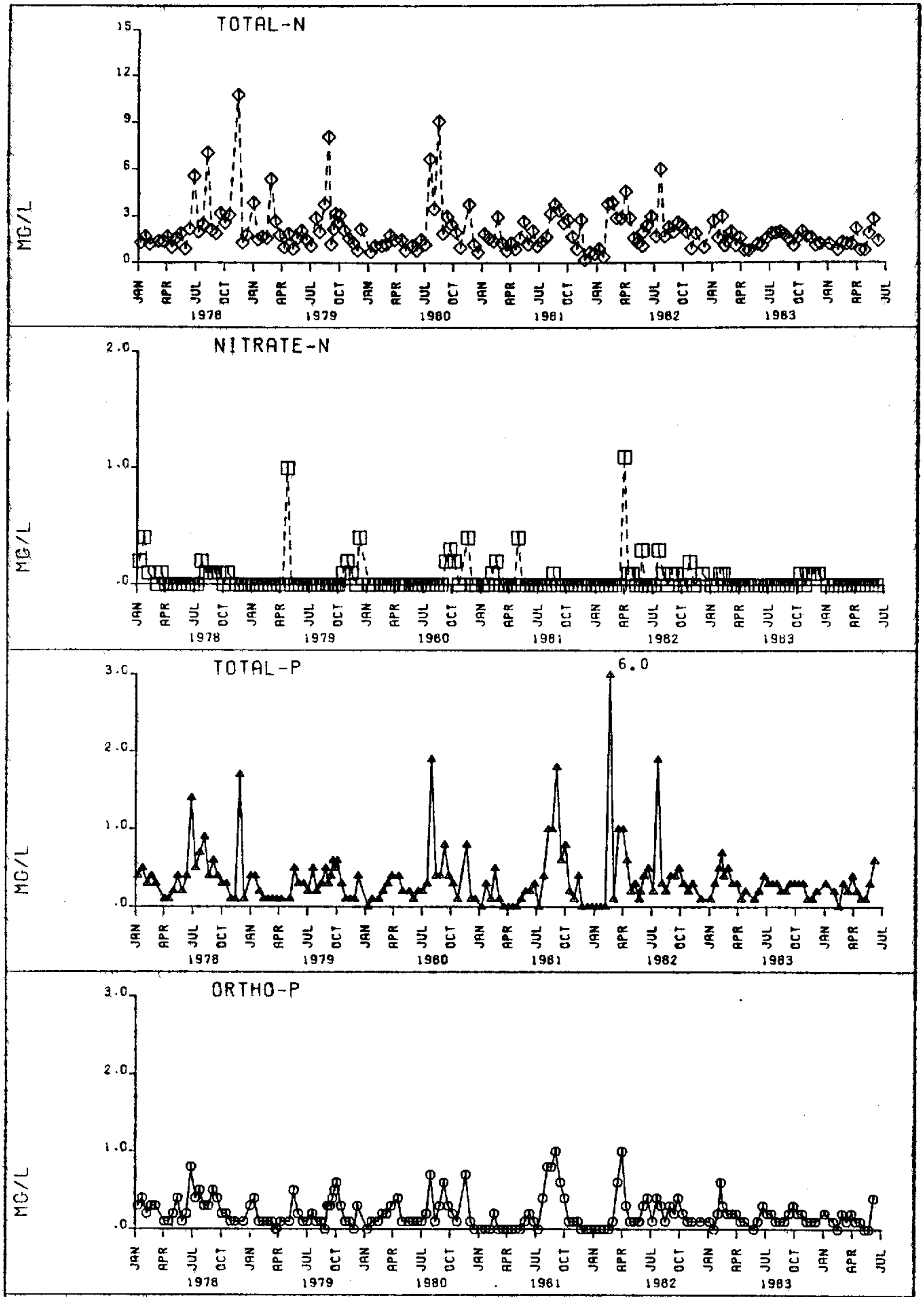


FIGURE WILLIAMSON DITCH STATION 09

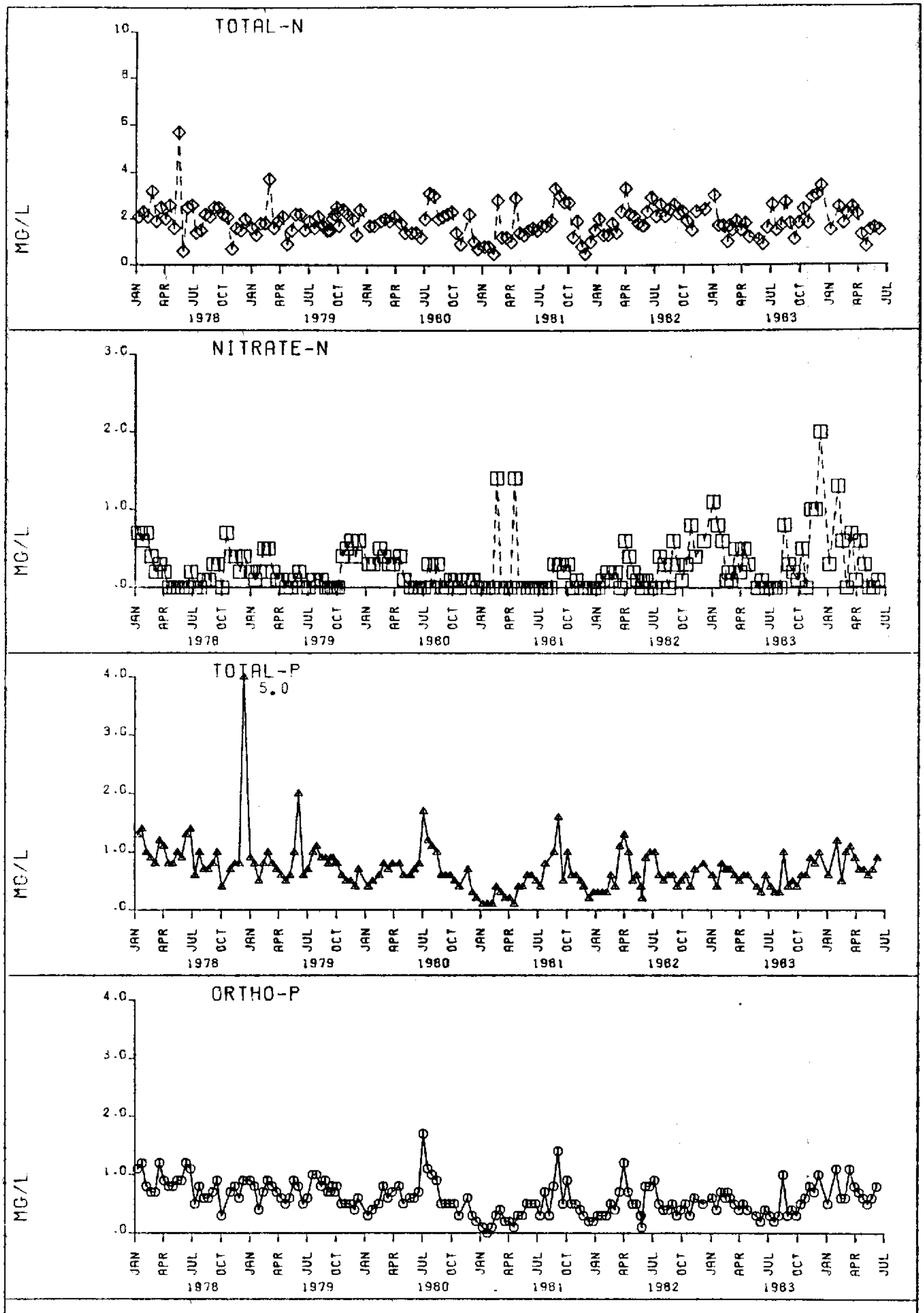


FIGURE UPPER TAYLOR CREEK STATION 11

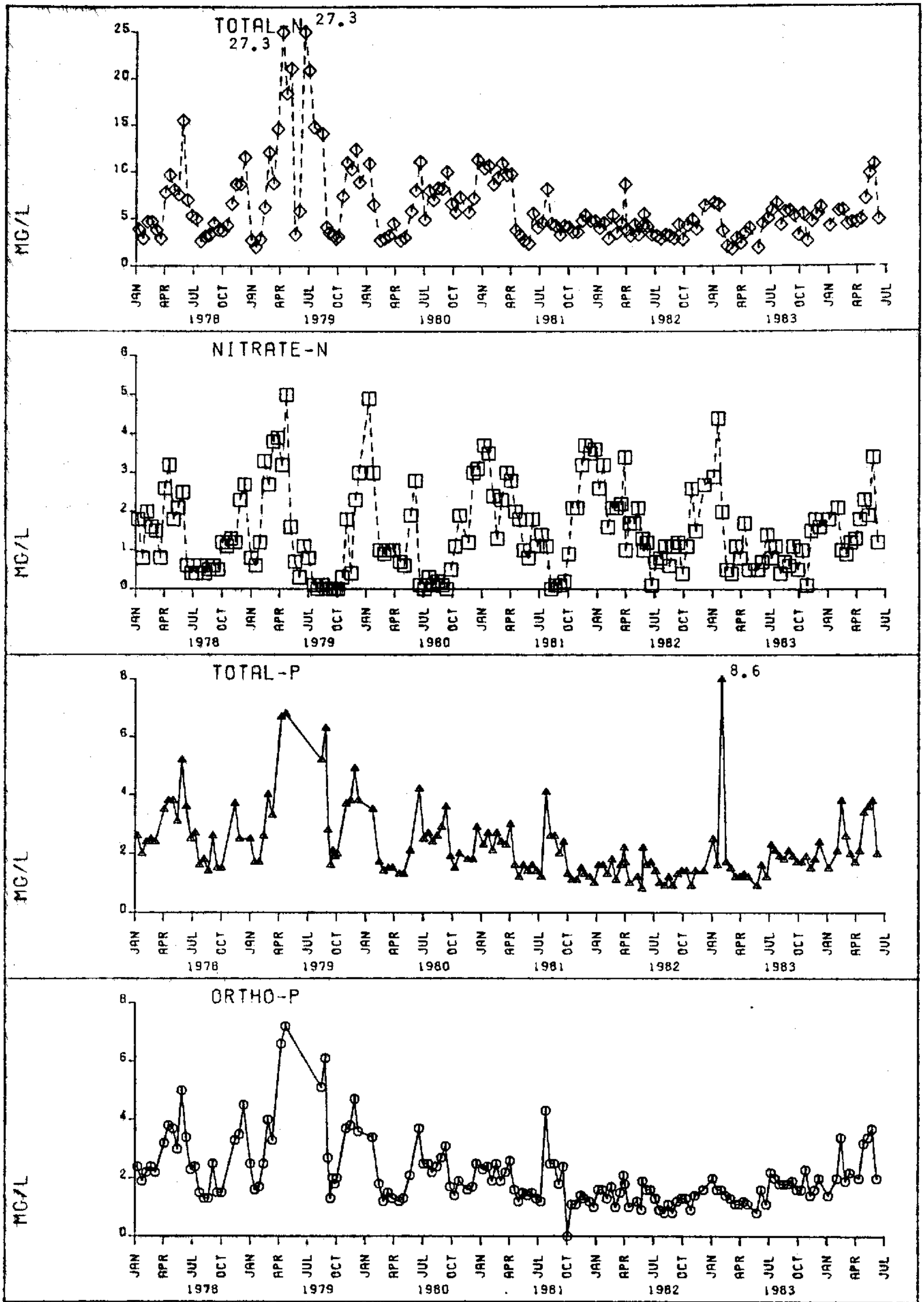


FIGURE MOSQUITO CREEK STATION 13

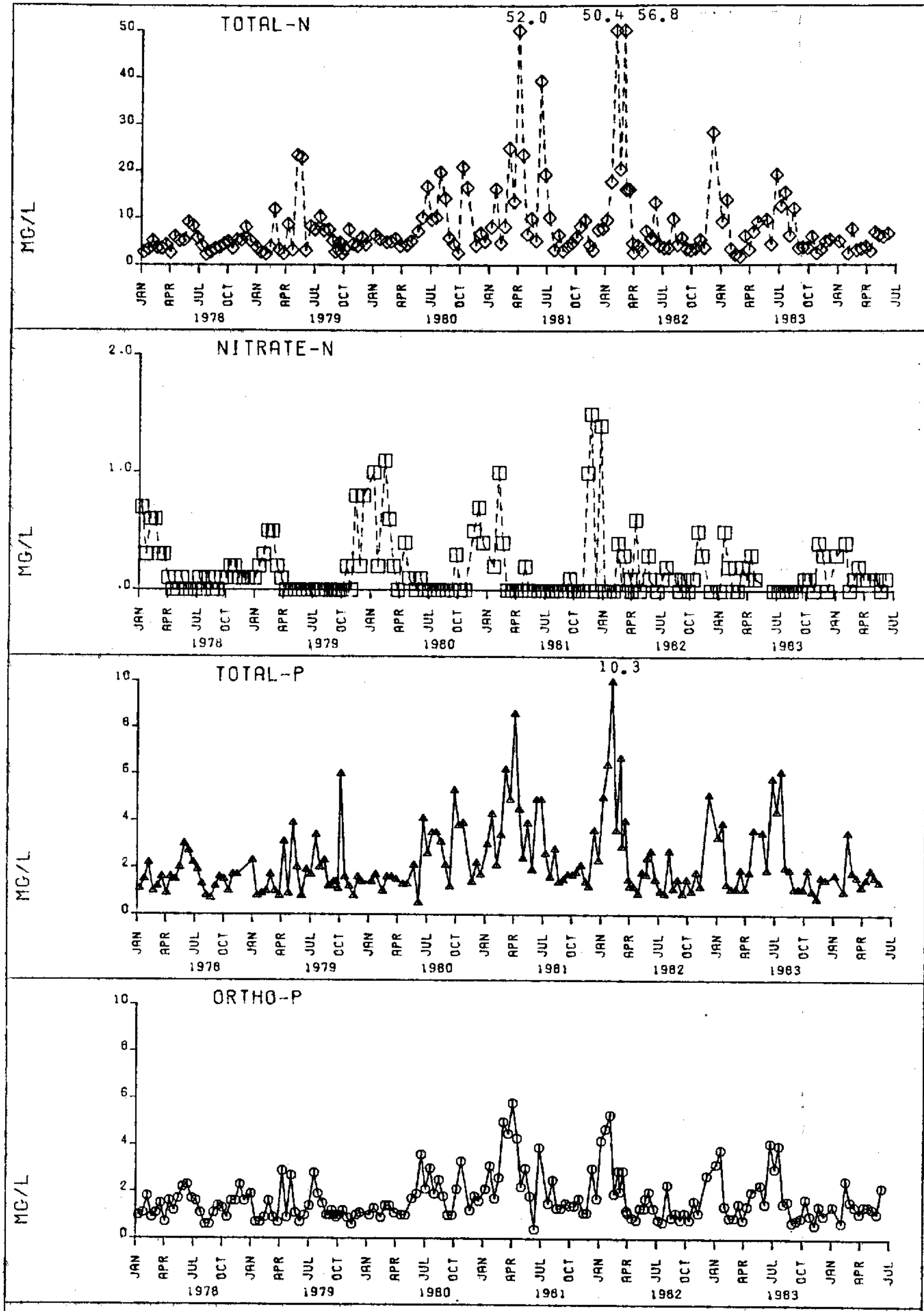


FIGURE NUBBIN SLOUGH STATION 14

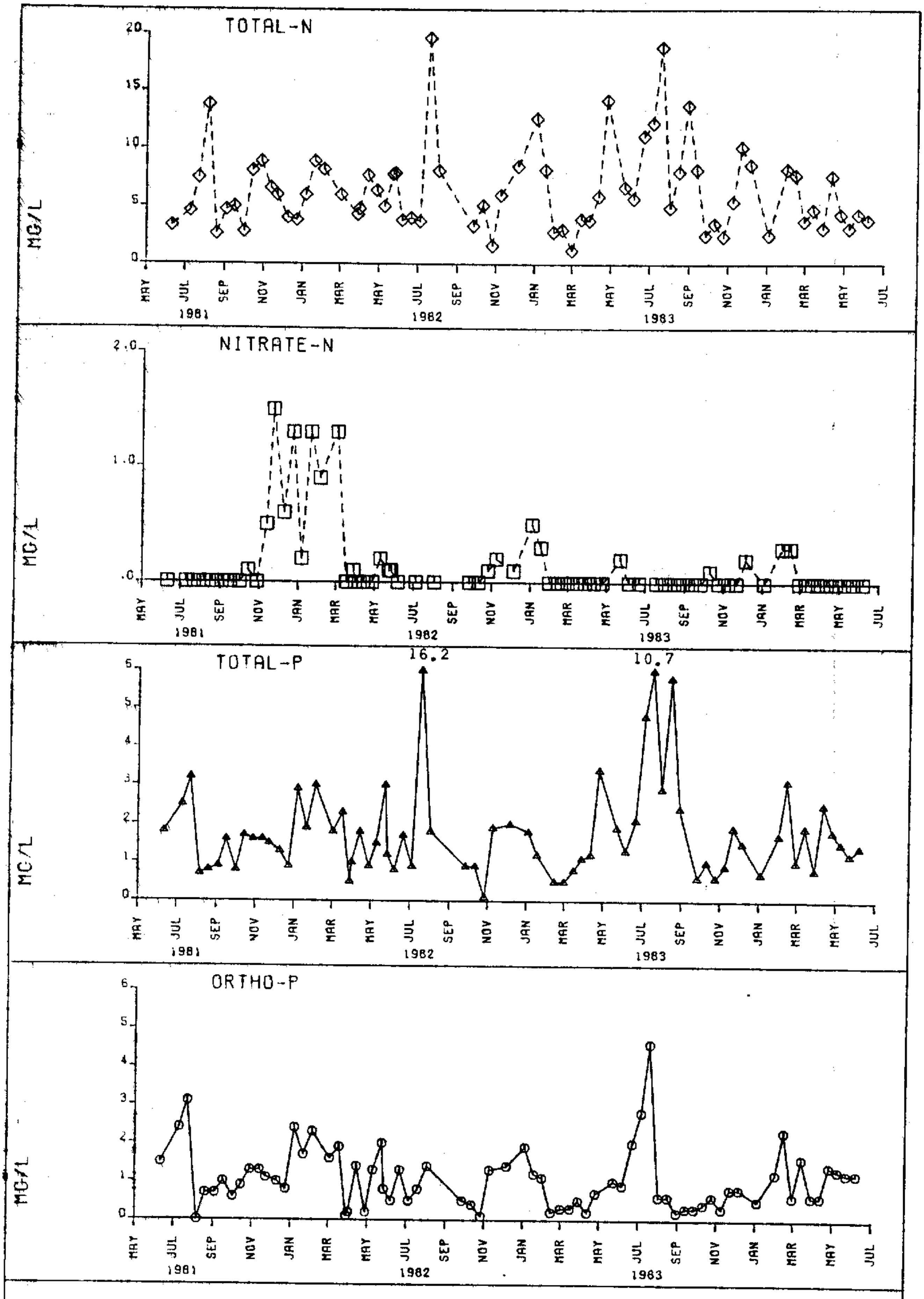


FIGURE HENRY CREEK STATION 39

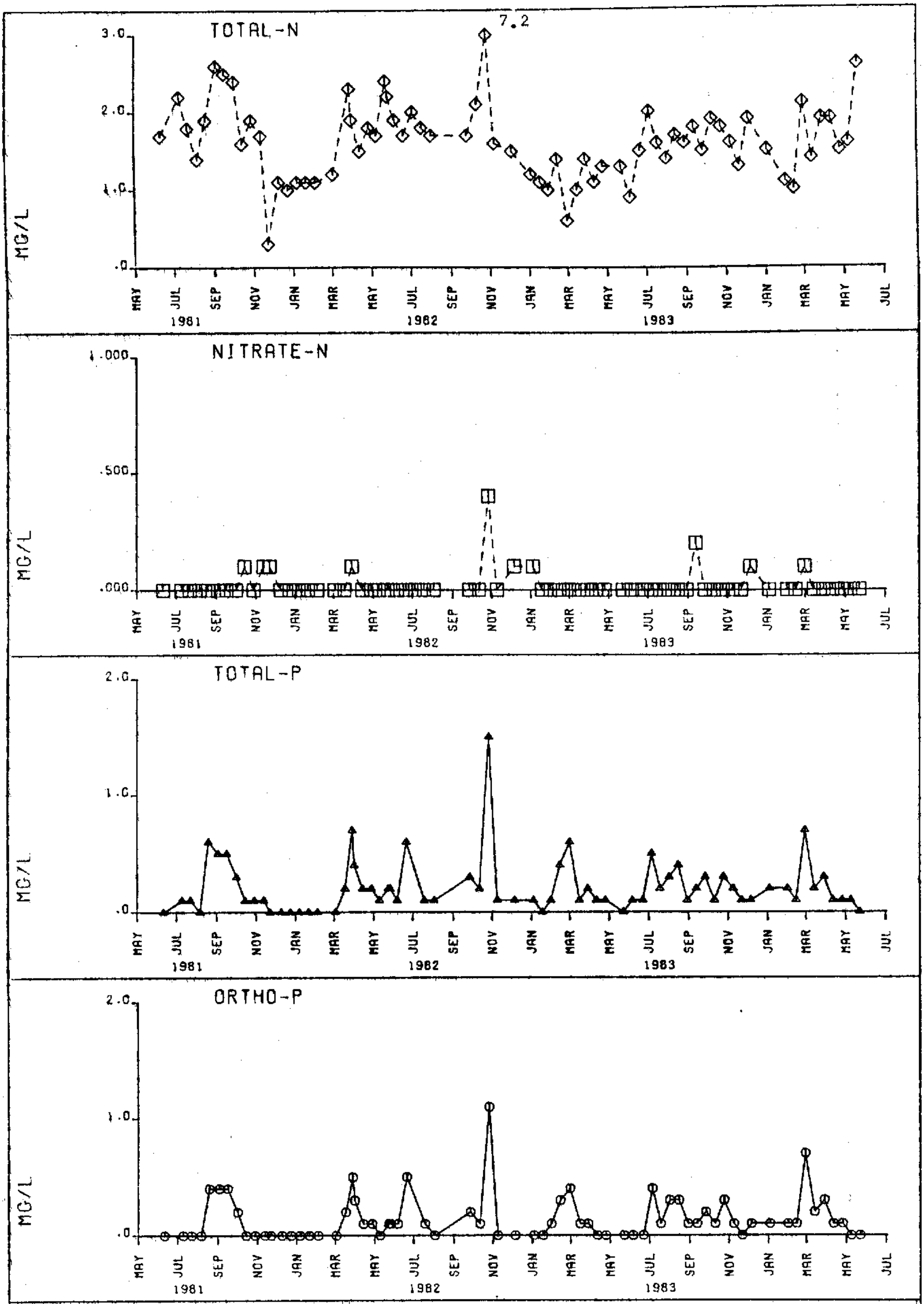


FIGURE LETTUCE CREEK STATION 40

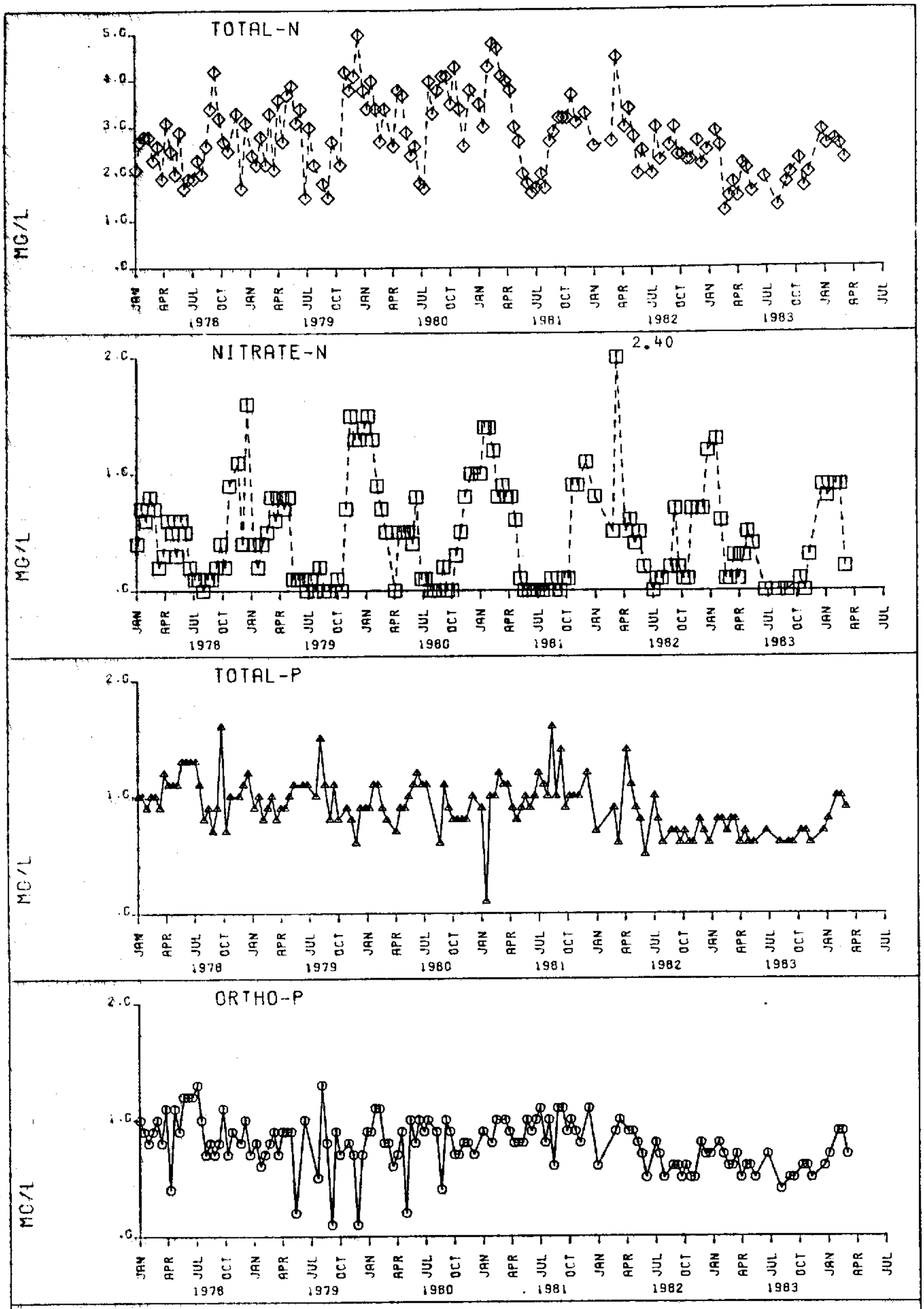


FIGURE S191 AT LAKE OKEECHOBEE

APPENDIX 6

COOPERATIVE AGREEMENT

RWB/ep
9902/308

AGREEMENT BETWEEN THE

AGRICULTURAL STABILIZATION AND CONSERVATION SERVICE

AND THE

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Subject: Cooperative Agreement for Providing Water Quality Monitoring for the Taylor Creek/Nubbin Slough - RCWP

1 Purpose

The Rural Clean Water Program (RCWP), like all public investments, must be monitored and evaluated in terms of its performance in meeting established objectives and goals.

2 Background

The Agriculture, Rural Development, and Related Agencies Appropriation Act of 1980 (P.L. 96-108, 93 Stat. 821, 835) established the Rural Clean Water Program (RCWP). The regulations implementing the program (7 CFR, Section 700.3) provide, "At the national level, the Secretary of Agriculture will administer the RCWP in consultation with the Administrator, EPA, including EPA's concurrence in the selection of Best Management Practices (BMP's), as provided in the 1980 Appropriations Act." Section 700.3 of the regulations also reserved the authority to approve projects to the Secretary of Agriculture. Program administration was delegated to the Administrator, ASCS and the coordination of technical assistance to the Chief, Soil Conservation Service.

3 Activities

The monitoring will be performed as specified in the approved monitoring and evaluation plan and in accordance with the EPA document, "Guidance for the Development of Evaluation Plans for NPS Control Projects." No RCWP funds will be used for performing general monitoring.

An annual monitoring and evaluation report will be prepared for the project as required by RCWP regulations 7 CFR Part 700 Paragraph 700.40. The regulations require that the report cover the following items:

(1) A description of water quality monitoring strategy for the area,

(2) Data collection schedule,

(3) Parameters being monitored (and baseline values),

(4) Collection and analytical methods,

(5) A summary of existing data and trends.

4 Reporting Requirements

A By November 15 of each year, the project will submit an annual monitoring and evaluation progress report according to Attachment A, "Report Format". The initial report will also include:

(1) A copy of the monitoring plan.

(2) A map outlining the project area with demarcation of the critical area, monitoring stations, and farm boundaries with ASCS farm numbers.

B Provide water quality sampling data to North Carolina State University according to instructions that will be provided later.

C Provide the socioeconomic survey data according to instructions that will be provided later.

D The State and Local Coordinating Committee will obtain commitments with parties responsible for meeting reporting requirements as specified in Attachment A, and B.

5 Agreement Duration

This Agreement shall remain in effect throughout the life of the Taylor Creek/Nubbin Slough - RCWP Project, not to exceed 15 years. However, the Agreement and Monitoring Plan shall be reviewed annually and amended as necessary by the mutual consent of the Administrator, ASCS, and the Chairperson, State Coordinating Committee.

6 Funding

Should the South Florida Water Management District (SFWMD) fail to establish and budget moneys to fund its part of this agreement in any fiscal year during the life hereof, either because (i) the SFWMD Governing Board refuses or fails to approve such funding; or (ii) because of action of the Legislature of the State of Florida prohibiting the funding for any reason, the SFWMD shall terminate this Agreement as of the date when presently budgeted funds are totally spent, and notification of such termination shall be given to the ASCS-SCS, in writing, as soon as the SFWMD has knowledge of the failure, refusal or prohibition to fund the Agreement.

Jack Cahen	Oct. 29, 1981
Chairperson, Local Coordinating Committee	Date
	11/2/81
Chairperson, State Coordinating Committee	Date
	Sept. 30, 1981
South Florida Water Management District	Date

APPENDIX 7

APPROVED BMP'S FOR THE TAYLOR CREEK-NUBBIN SLOUGH PROJECT

BMP-1	Permanent Vegetative Cover
BMP-2	Animal Waste Management System
BMP-5	Diversion System
BMP-6	Grazing Land Protection System
BMP-8	Cropland Protection Systems
BMP-10	Stream Protection System
BMP-11	Permanent Vegetative Cover on Critical Areas
BMP-12	Sediment Retention, Erosion, or Water Control Structures
BMP-13	Improving an Irrigation and or Water Management System

*--BMP-1 PERMANENT VEGETATIVE COVER

A Purpose. To improve water quality by establishing permanent vegetative cover on farm or ranchland to prevent excessive runoff of water contributing to water pollution.

B Applicability. To farm or ranch land where substantial amounts of pollutant runoff contributes to water pollution.

C Policies. This practice is limited to measures that establish and materially extend the life of the permanent cover by such means as seeding, application of fertilizer and/or liming material, fencing, seedbed preparation and earthmoving.

D Lifespan. The vegetative cover which has been improved or protected shall be maintained for a minimum of 5 years following the calendar year of installation.

E Specifications.

1. Technical responsibility is assigned to SCS.

2. Components:

	SCS Code
Fencing	- 382
Grasses and legumes in rotation	- 411
Pasture and hayland management	- 510
Pasture and hayland planting	- 512
Proper grazing use	- 528
Planned grazing systems	- 556

3. Specifications for each component of this practice are available in the local SCS field office.

F Federal Cost-share

No cost-shares.--*

BMP-2 ANIMAL WASTE MANAGEMENT SYSTEM

A <u>Purpose</u>. To improve water quality by providing facilities for the storage and handling of livestock waste to abate pollution that may otherwise result from livestock operations.

B <u>Applicability</u>. This practice is applicable on all farmland where animal waste from the farm constitutes a significant pollution hazard.

C <u>Policies</u>.

1 This practice is designed to provide facilities for the handling of livestock waste and the control of surface runoff water to permit the recycling of animal waste on the land or back to the barn in a way that will prevent or abate pollution that would otherwise result from livestock operations.

2 Cost-sharing is limited to solving the pollution problems where the livestock operation is a part of the total farming operation.

3 Cost-sharing is authorized:

a Only for animal waste facilities such as aerobic or anaerobic lagoons as well as diversions, channels, waterways, outlet structures, piping, land shaping, and similar measures needed as a part of a system on the farm to manage animal wastes.

b For:

(1) Permanently installed equipment needed as an integral part of the system. Pumping equipment is considered eligible for cost-sharing when:

(a) Pumping equipment is anchored and remains attached to the distribution system except that the pump may be detached and moved to different locations around the same lagoon system; and

(b) The pump is the type that normally cannot be used for other purposes without alterations.

(2) Fencing and vegetative cover (including mulching) needed to protect the facility.

(3) Leveling and filling to permit the installation of an effective system.

c Only if the facilities will contribute significantly to maintaining or improving the water quality.

D Lifespan. The practice shall be maintained for a minimum of 10 years following the calendar year of installation.

E Specifications.

1 Technical responsibility is assigned to SCS.

2 Components:

Components	SCS Code
Waste management system	312
Critical area planting	342
Dike	356
Waste treatment lagoon	359
Diversion	362
Fencing	382
Filter strips	393
Grassed waterway or outlet	412
Irrigation system, sprinkler	442
Irrigation system, surface and subsurface	443
Subsurface drain	606
Subsurface drain, field ditch	607
Surface drain, main or lateral	608
Waste utilization	633
Pumping plant for water control	533
Wash water recovery system	634

3 Standards and specifications for each component are available in the local SCS field office.

F Federal Cost-share.

1 75 percent of actual cost of eligible components (except components 533 and 634) not to exceed average costs as listed in publication on file in the county ASCS office.

2 60 percent of the actual cost of eligible components 533 and 634 not to exceed the average costs as listed in publication on file in the county ASCS office.

BMP-5 DIVERSION SYSTEM

A <u>Purpose</u>. To improve water quality by installing diverions on farmland where excess surface or subsurface water runoff contributes to a water pollution problem.

B <u>Applicability</u>. This practice is applicable on all farmland where excess surface or subsurface water runoff contributes to a water pollution problem.

C <u>Policies</u>.

1 Cost-sharing is authorized for minerals, eligible seed or plants, seedbed preparation, earthmoving and needed materials.

2 The acreage seeded must be protected from grazing by domestic livestock until the stand is well established.

3 Consideration should be given to the needs of wildlife when determinations as to seed varieties and other practice specifications are made.

-4 Cost-sharing is authorized for diversions, ditches, dikes, installation of structures such as pipe, chutes, underground outlets, or other outlets, if needed, for proper functioning of a ditch or dike, for more even flow, necessary leveling and filling to permit installation of an effective system. Subsurface drains may be installed where necessary for the proper functioning of the diversion.-

5 Cost-sharing shall be limited to minimum minerals, seed or plants, seedbed preparation, earthmoving and needed materials to achieve stated purpose.

D <u>Lifespan</u>. The practice shall be maintained for a minimum of 10 years following the calendar year of installation.

E <u>Specifications</u>.

1 Technical responsibility is assigned to SCS.

2 Components:

	SCS Code
Dike	- 356
Diversion	- 362
Subsurface drain	- 606
*-- Underground outlet	- 620 --*

3 Standards and specifications for each component are available in the local SCS field office.

F <u>Federal Cost-share</u>.

75 percent of actual cost of eligible components not to exceed average costs as listed in publication on file in county ASCS office.

BMP-6 GRAZING LAND PROTECTION SYSTEM

A Purpose. To improve water quality through better grazing distribution and better grassland management by developing wells, ponds, and installing pipelines and storage facilities.

B Applicability. This practice is authorized only when needed to correct an existing problem causing water pollution due to over concentration of livestock.

C Policies.

1 Cost-sharing is authorized for:

a Construction of wells.

b Construction of dugouts or ponds.

c Installing pipelines, troughs, and storage facilities.

2 Wells must be provided with pumping equipment and adequate storage facilities.

3 Cost-sharing is not authorized for any system which is:

a Primarily for recreation, wildlife, dry lot feeding, corrals, or barns.

b For the purpose of providing water for the farm or ranch headquarters.

4 All State and county laws, rules, and regulations governing the installation of wells shall be strictly adhered to. The farm owner shall furnish the permit required for installing wells.

D Lifespan. The practice shall be maintained for a minimum of 10 years following the calendar year of installation.

E Specifications:

1 Technical responsibility is assigned to SCS.

2 Components:

	SCS Code
Ponds	- 378
Pipelines	- 516
Trough or tank	- 614
Well	- 642

3 Specifications for each component of this practice are available in the local SCS field office.

*-- BMP-8 CROPLAND PROTECTION SYSTEMS

A <u>Purpose</u>. The purpose is to improve water quality by insuring that a crop rotation is used on cropland to effectively utilize waste effluent.

B <u>Applicability</u>. Apply this practice to cropland needing protection from waste effluent runoff applied to this land between crops or pending establishment of enduring protective vegetative cover.

C <u>Policies</u>. A good stand and growth must be obtained and must be maintained on this land for a period specified by the COC.

D <u>Lifespan</u>. The cover must be maintained without cost-shares from the period when the crop is removed until the beginning of the normal planting period for the succeeding crop.

E <u>Specifications</u>.

1 Technical responsibility is assigned to SCS.

2 Components:

	SCS Code
Conservation cropping system	- 328
Cover and green manure crop	- 340

3 Specifications for each component of this practice are available in the local SCS field office.

F <u>Federal cost-share</u>.

No cost-shares.--*

BMP-10 STREAM PROTECTION SYSTEM

A Purpose. To improve water quality by protecting streams from animal waste, sediment or chemicals through the installation of vegetative filter strips, protective fencing, portable livestock shade structures, and livestock crossings.

B Applicability. On stream banks and associated areas contributing to a water quality problem.

C Policies.

1. Cost-sharing is authorized for seed or plants, minerals, portable livestock shade structures, land clearing and leveling for fencing, fencing, and livestock crossings.

2. The acreage seeded must be protected from grazing by domestic livestock until the stand is well established.

3. Cost-sharing shall be limited to the minimum minerals, seed or plants, land clearing for fencing, spoilbank spreading for fencing, fencing, and livestock crossings needed to control pollution for water quality improvement.

D Lifespan. The practice shall be maintained for a minimum of 10 years following the calendar year of installation.

E Specifications.

1 Technical responsibility is assigned to SCS.

2 Components:

	SCS Code
Fencing	- 382
Filter Strip	- 393
Livestock Shade Structure (portable)	- 473 (Interim)
Streambank Protection	- 580

3 Specifications for each component of this practice are available in the local SCS field office.

F Federal Cost-share.

75 percent of actual cost of eligible components not to exceed average costs as listed in publication on file in county ASCS office.
--Cost-shares are allowed only in this BMP and BMP's 2 and 12 for component 382.--

*--BMP-11 PERMANENT VEGETATIVE COVER ON CRITICAL AREAS

A Purpose. This practice is to stabilize and improve filtration capabilities of critical areas adjacent to streams and ditches.

B Applicability. Apply this practice to critical areas such as banks of streams and ditches, on areas that are susceptible to erosion or where runoff carrying substantial sediments or pollutants constitutes a significant water pollution hazard.

C Policies. This practice is for measures needed to stabilize a source of sediment (such as grading, shaping, and filling), the establishment (including minerals) of grasses (including filter strips), trees or shrubs, and similar measures which are practical for the solution of the problem.

D Lifespan. The acres shall be maintained for a minimum of 5 years following the year of installation.

E Specifications.

1 Technical responsibility is assigned to SCS.

2 Components:

	SCS Code
Critical area planting	- 342
Fencing	- 382
Field Borders	- 386
Filter strips	- 393
Livestock exclusion	- 472
Mulching	- 484
Spoilbank spreading	- 572
Tree planting	- 612
Well plugging	- 643

3 Specifications for each component of this practice are available in the local SCS field office.

F Federal cost-share.

No cost-share. --*

BMP-12 SEDIMENT RETENTION, EROSION, OR WATER CONTROL STRUCTURES

A Purpose. To improve water quality through the control of erosion, including sediment and chemical runoff, from a specific problem area thereby preventing water pollution.

B Applicability. To problem areas identified on farms where runoff of substantial amounts of pollutants contribute to water pollution.

C Policies.

1 Cost-sharing is not authorized for irrigation structures which are a part of a distribution system for irrigation water.

2 All laws, rules, and regulations governing the construction and use of water storage and management facilities shall be followed. The landowner or operator shall be responsible for obtaining all necessary permits from the appropriate Water Management District or regulatory agency.

D Lifespan. The structures shall be maintained for a minimum of 10 years following the calendar year of installation.

E Specifications.

1 Technical responsibility is assigned to SCS.

2 Components:

	SCS Code
Dike	- 356
Fencing	- 382
Structure for water control	- 587
Water and sediment control basin	- 638

3 Specifications for each component of this practice are available in the local SCS field office.

F Federal cost-share.

75 percent of actual cost of eligible components not to exceed average costs as listed in publication on file in county ASCS
--office. Cost-shares are allowed only in this BMP and BMP's 2 and 10 for component 382. --

*--BMP-13 IMPROVING AN IRRIGATION AND OR WATER MANAGEMENT SYSTEM

A Purpose. To improve water quality on farmland that is currently under irrigation for which an adequate supply of suitable water is available, on which irrigation will be continued, and on farmland with a critical area or source that significantly contributes to the water quality problem by the following:

1 Installation of tailwater return systems.

2 Conversion to a different system to reduce water pollutants.

3 Reorganization of an existing system to reduce water pollutants.

B Applicability. Apply this practice to land currently under irrigation for which an adequate supply of suitable water is available, on which irrigation will continue, and on which signigicant soil or water conservation problems exist.

C Policies. This practice is for permanently installed systems; land leveling; and tailwater recovery systems or other installations for the conservation of soil or water where needed as an integral part of the irrigation system being reorganized to improve water quality.

D Lifespan. The system must be maintained for a minimum of 10 years following the calendar year of installation.

E Specifications.

1 Technical responsibility is assigned to SCS.

2 Components:

	SCS Code
Irrigation water conveyance	- 428
Pipeline	- 430
Irrigation system, drip	- 441
Irrigation system, sprinkler	- 442
Irrigation system, surface and subsurface	- 443
Irrigation system, tailwater recovery	- 447
Irrigation water management	- 449
Irrigation land leveling	- 464
Structure for water control	- 587

3 Specifications for each component of this practice are available in the local SCS field office.

F Federal cost-share.

No cost-share.--*